INFANT MORTALITY IN THE MUNICIPALITY OF RIO VERDE

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ABSTRACT

Infant mortality is widely recognized as an essential indicator of quality of life and health services in a population. This study was carried out in the municipality of Rio Verde, Goiás, between 2019 and 2023, with the objective of identifying patterns and determinants of infant mortality, in addition to evaluating the effectiveness of local health policies. The descriptive methodology was based on data from the SIM and SINASC systems, analyzing live births and infant deaths, focusing on characteristics such as birth weight, gestational age, causes of death, place of care and socioeconomic profile of the mothers. The results revealed that, over the five years analyzed, there was a gradual reduction in infant mortality, with emphasis on a significant drop between 2021 and 2022, the main causes of death were perinatal complications, neonatal infections, and low birth weight, prevailing among neonates with a gestational age below 37 weeks. A higher mortality rate was also observed among male children, a fact that follows the national trend. The conclusion reinforces the need to strengthen prenatal care, improve the infrastructure of health facilities and train professionals, especially those involved in neonatal care. Interventions aimed at promoting maternal and child health, such as awareness campaigns on the importance of prenatal care, breastfeeding and immunization, are recommended. Improving the quality of death records and continuous surveillance of these data are crucial to guide more effective public policies aimed at the sustainable reduction of infant mortality rates in Rio Verde.

Keywords: Infant mortality. Public health. Prenatal. Health indicators.

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INTRODUCTION

Infant mortality is widely recognized as a preventable event, especially when appropriate public health measures are implemented. However, in developing countries, the risk of death among children under one year of age remains high, reflecting weaknesses in health systems. This scenario demands the use of quality indicators that can assess and evidence the efficiency of health policies aimed at reducing infant mortality (BRASIL, 2019). Infant mortality is one of the most important indicators of public health, as it reflects not only the quality of medical care provided, but also the socioeconomic and environmental conditions that influence the health of the population. It is defined as the number of deaths of live births that occur between birth and less than one year of age (BRASIL, 2005; SANTOS JÚNIOR; JACOBE, 2009).

Research on infant mortality is of paramount importance, as this indicator is widely used to assess the quality of health services and the socioeconomic development of a population. Analyzing infant mortality rates allows the identification of gaps in the health care offered to pregnant women and newborns, in addition to providing subsidies for the formulation of public policies aimed at reducing these avoidable deaths. In the context of the municipality of Rio Verde, Goiás, this study becomes particularly relevant, since the localized analysis of infant mortality data can reveal regional particularities, pointing to social, economic, and environmental factors that contribute to the observed rates. The investigation also makes it possible to evaluate the effectiveness of health programs already implemented, monitor the fulfillment of national and international goals, such as the Sustainable Development Goals (SDGs), and propose interventions that can improve maternal and child care, thus contributing to the improvement of the health of the population and the reduction of health inequities.

This descriptive study uses data from the Ministry of Health's Mortality Information Systems (SIM) and Live Births (SINASC), referring to residents in the municipality of Rio Verde, Goiás, with an estimated population of approximately 225,696 inhabitants, according to the Brazilian Institute of Geography and Statistics (IBGE, 2022). The analysis covers records of deaths in children under one year of age and live births in the period from 2019 to 2023, with the objective of investigating patterns and possible determinants of infant mortality in this location.

RESULTS

In the study period, between 2019 and 2023, there were 207 infant deaths in the municipality of Rio Verde - GO, with the years 2019 and 2020 representing the highest

number of deaths (48 deaths) and also the highest number of live births, bringing 3,433 and 3,330 live births, respectively.

The infant mortality rate in the municipality of Rio Verde occurred between 2019 and 2023, represented by table 1, where the highest mortality rate recorded in children under 1 year old was in 2020 with 14.41% (48 deaths) and the lowest in 2022 with 9.56% (31 deaths). With this, we can observe that the infant mortality rate has been reducing over the analyzed period with the greatest impact on this reduction between 2021 and 2022 and, subsequently, rising by 1.35% in 2023.

It should be noted that the Infant Death indicator, between the years 2019 and 2023, followed the trend in Brazil, following what the United Nations (UN) determines, which is ten deaths for every thousand live births, an infant mortality rate in 10 years.

Table 01: Number of infant deaths in the municipality of Rio Verde – GO between the years 2019 and 2023 in relation to the number of live births and the mortality rate

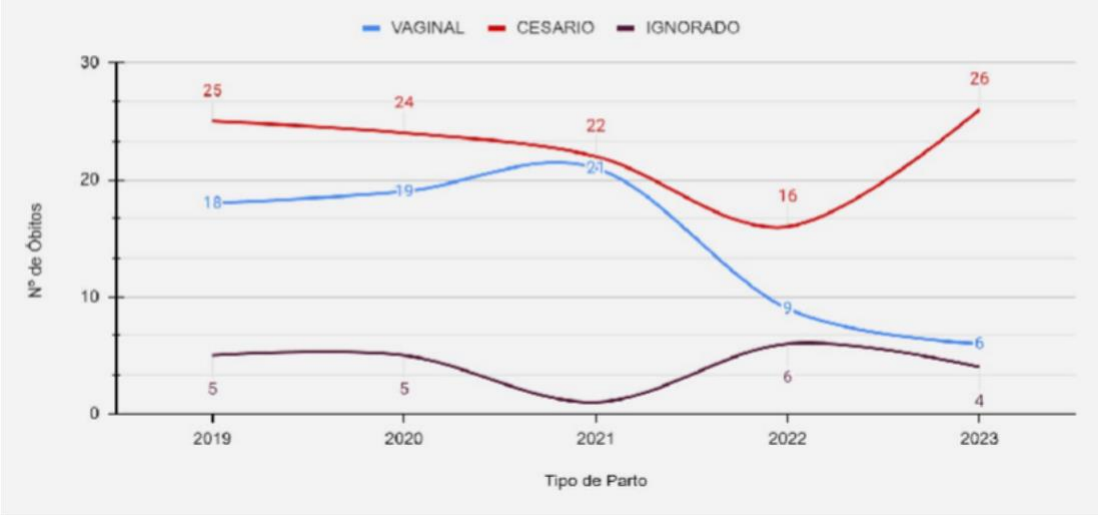
REFERENCE YEAR	NUMBER OF LIVE BIRTHS	NUMBER OF DEATHS	MORTALITY RATE
2019	3433	48	13,98%
2020	3330	48	14,41%
2021	3279	44	13,42%
2022	3244	31	9,56%
2023	3302	36	10,90%

Source: Information System on Live Births (SINASC, 2023).
Source: DATASUS - SIM - Mortality Information System

Although some studies have suggested a possible association between cesarean delivery and a slight increase in the risk of infant mortality, it is important to consider the complexity of these relationships. The type of delivery may be just one of many factors that influence the health outcome of the baby and the mother, and the decision about the method of delivery should be based on a careful assessment of the individual risks and benefits in each clinical situation.

According to care factors associated with infant mortality, in the municipality of Rio Verde - GO in the years 2019 to 2023, when we evaluated the number of infant deaths related to the type of delivery, we can observe that the year 2023 had the highest number of cesarean deliveries during the period evaluated, representing 26 out of a total of 36 deliveries and, Regarding vaginal delivery, throughout the period analyzed, the modality maintained a smaller volume in relation to cesarean delivery. It was also possible to evaluate the quality of the data by showing that part of the data were recorded incorrectly, describing the type of delivery as unknown.

Graph 01: Number of infant deaths that occurred in Rio Verde - Go between the years 2019 and 2023 according to type of delivery.

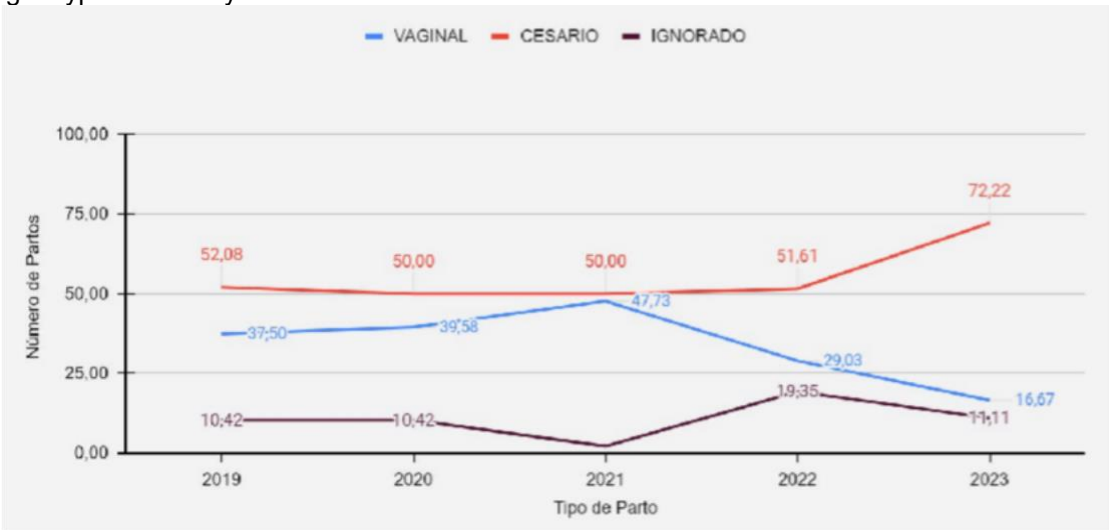


Source: Information System on Live Births (SINASC, 2023).

Both vaginal delivery and cesarean section have their specific indications and should be considered based on the individual medical situation of the mother and baby. The goal is to ensure the safety and well-being of both during the birth process.

When we evaluate the proportion of deliveries performed, we can understand more clearly when we associate the number of live births in the same period in relation to the year to obtain the proportion between the two types of deliveries. As shown in graph 02, we can see that vaginal delivery represents a higher proportion in all the years analyzed, however, in 2023, the difference in the proportion of types of delivery reached a greater distance, reaching 55.56%. The year 2021 was the year where the difference between the types of delivery presented the lowest number, placing cesarean delivery only 2.27% ahead of vaginal delivery.

Graph 02: Proportion of infant deaths that occurred in Rio Verde - GO between the years 2019 and 2023 according to type of delivery.

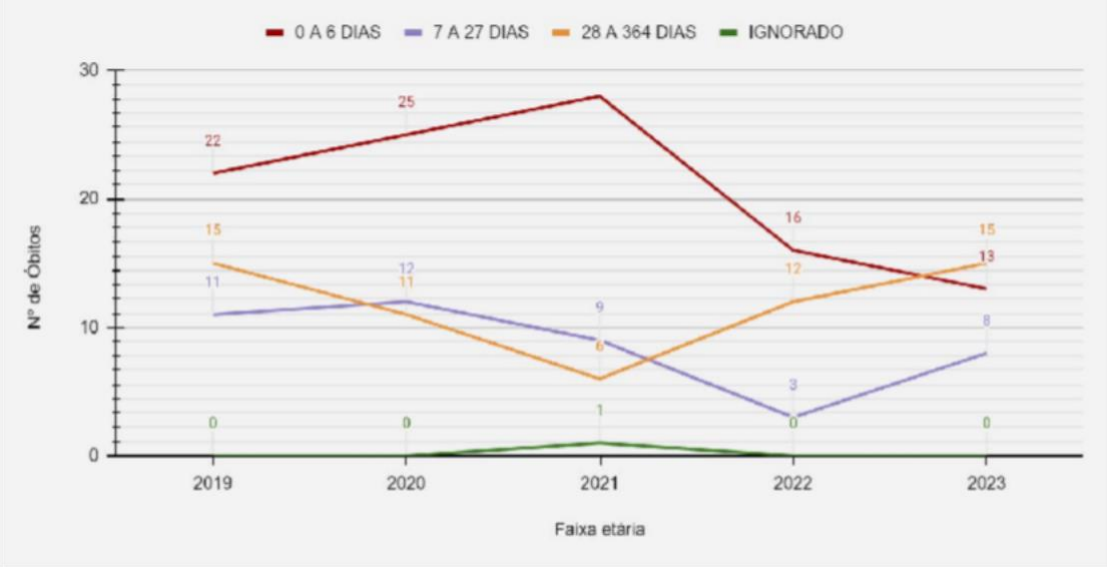


Source: Information System on Live Births (SINASC, 2023).

The risk of infant death can vary according to the baby's age group. The early neonatal period, which comprises the first 7 days of life, is particularly critical in terms of the risk of infant mortality. During this time, newborns are more vulnerable to complications related to childbirth, prematurity, low birth weight, neonatal infections, asphyxia and congenital problems.

The early neonatal mortality rate tends to be higher than the post-neonatal mortality rate throughout the national territory and, in Rio Verde – GO, during the period evaluated, the data present similar data. When we relate the number of infant deaths to age group, we can observe that the mortality rate remained higher in individuals aged between 0 and 6 days during the period evaluated, except in 2023 where deaths in individuals aged between 28 and 364 were higher than the number of deaths in neonates.

Graph 04: Number of infant deaths that occurred in Rio Verde - GO between the years 2019 and 2023 according to the age group of the newborn.

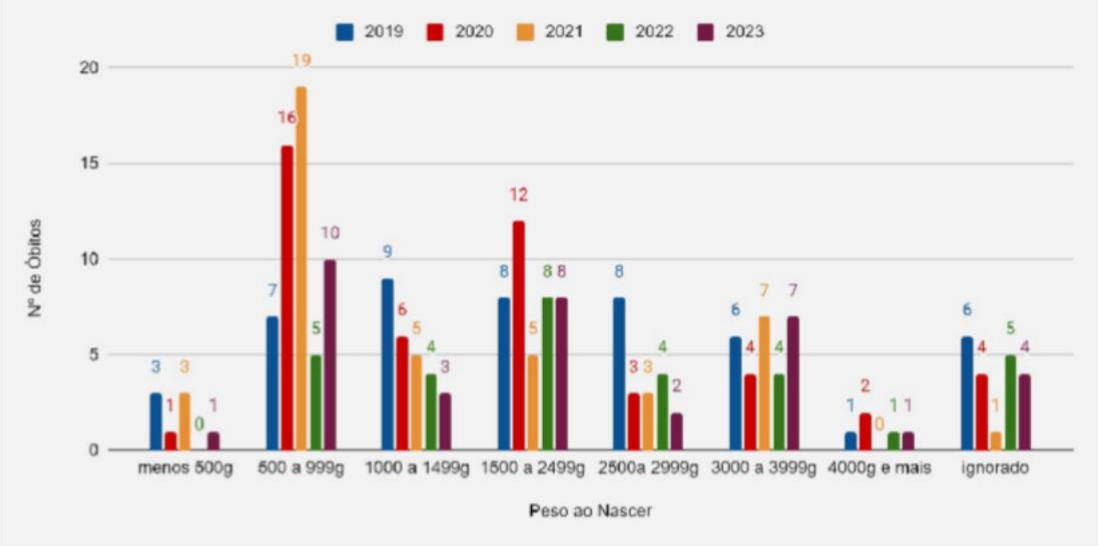


Source: DATASUS - SIM - Mortality Information System

According to the UN, low birth weight represents an important risk factor for morbidity, neonatal mortality, and infant mortality. Low birth weight is an indicator that serves as a predictor of child survival: the lower the birth weight, the greater the probability of early death. Birth weight, according to the World Health Organization (WHO, 1995), is the first measurement made on the newborn. "inadequate or insufficient weight", between 2,500 and 2,999 grams and low weight, if weight less than 2,500 grams. Very low birth weight, when less than 1,500 grams and extremely low birth weight, when less than 1000 grams. (WHO, 2014)

As shown in graph 05, in relation to birth weight, the highest occurrence of infant deaths is among children who weighed between 500g and 999g, evidenced mainly in the years 2020 and 2021.

Graph 05: Infant Deaths by household Rio Verde-GO, according to birth weight, in the years 2019 to 2023.

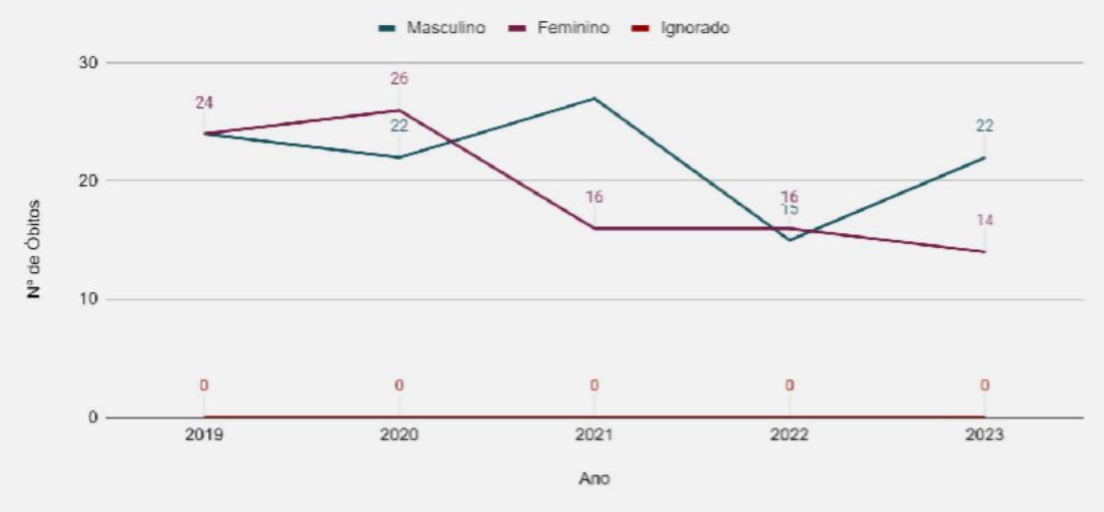


Source: DATASUS - SIM - Mortality Information System

The results showed that in the municipality of Rio Verde in the years 2019 to 2023, of the total of 207 infant deaths, 110 (53.14%) deaths were male, predominantly in relation to female mortality 96 (46.38%) deaths.

Several studies show a higher mortality rate for male children: data from the IBGE, for example, show that in 2015, in Brazil, the probability of male children not completing the first year of life is 14.9 per thousand live births and for females, 12.7 per thousand live births. The causes of this difference are linked to biological factors, which indicate a greater fragility of male babies to some types of disease linked to external causes, such as diarrhea, hemorrhages and pneumonia. Male fetuses have a higher risk of miscarriage due to a higher incidence of genetic alterations. (BRAZIL, 2019).

Graph 06: Number of Infant Deaths that occurred in Rio Verde-GO in the years 2019 to 2023 according to sex.

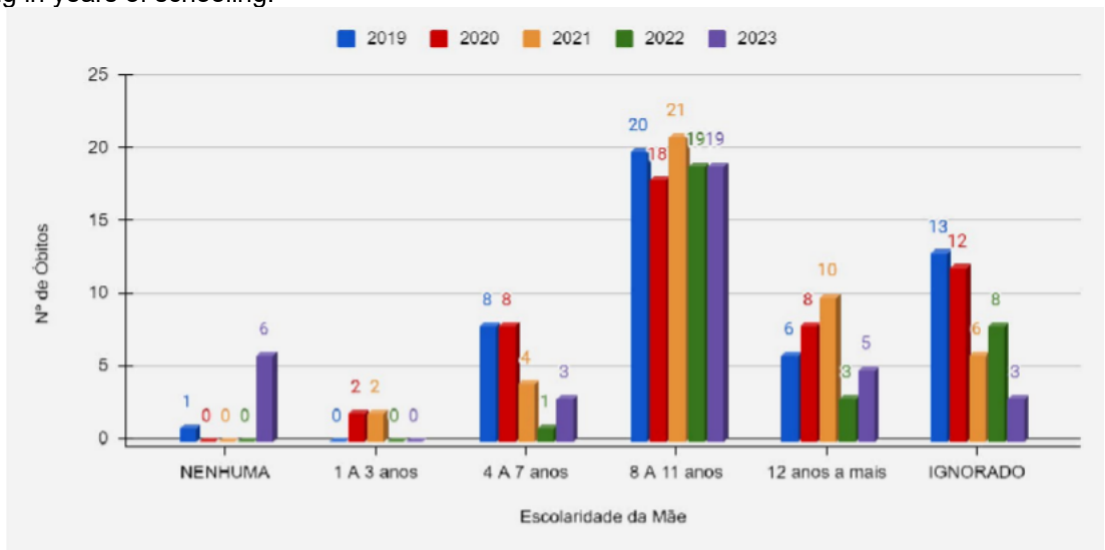


Source: DATASUS - SIM - Mortality Information System

Many authors state that low education is a multivariate factor, since it reflects the socioeconomic and cultural condition in which the newborn's family members live, even influencing family planning and the use, or not, of contraceptive methods (MAIA et al., 2012; LIMA et al., 2015; SANDERS et al., 2017; LANSKY et al., 2014). However, low schooling is not the most important factor linked to infant deaths.

According to graph 7, in the municipality of Rio Verde, it was observed that in the years 2019 to 2023, the trend in the risk of infant death did not decrease as the level of maternal education increased and, based on this, the data show that 97 of the mothers attended school for a period of 8 to 11 years, 46.86% and, only 7 mothers did not attend school at any time, 3.38%.

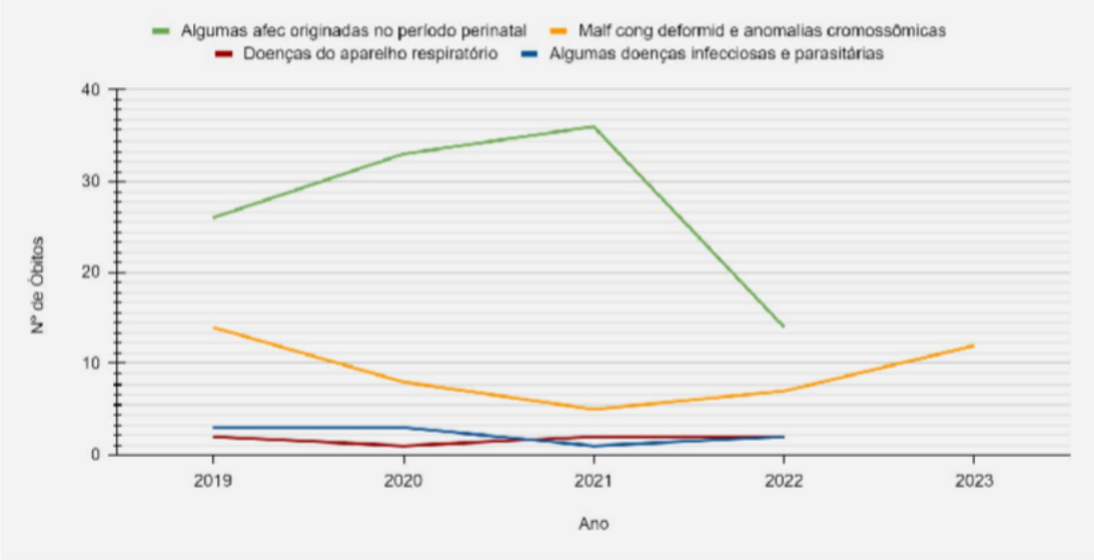
Graph 07: Infant deaths occurred in Rio Verde - GO in the years 2019 to 2023, according to the mother's schooling in years of schooling.



Source: DATASUS - SIM - Mortality Information System

The main causes of infant death are multifactorial and can vary according to socioeconomic context, access to health care, public policies, and other factors. In Brazil, some of the main causes of infant death include respiratory diseases, perinatal complications, infections, and congenital malformations. In the municipality of Rio Verde, the statistics follow the same pattern, as we can see in graph 08, the conditions of the perinatal period lead the main causes in the entire period of analysis, followed by congenital malformations.

Graph 08: Main causes of infant deaths, Rio Verde - GO in the years 2019 to 2023.

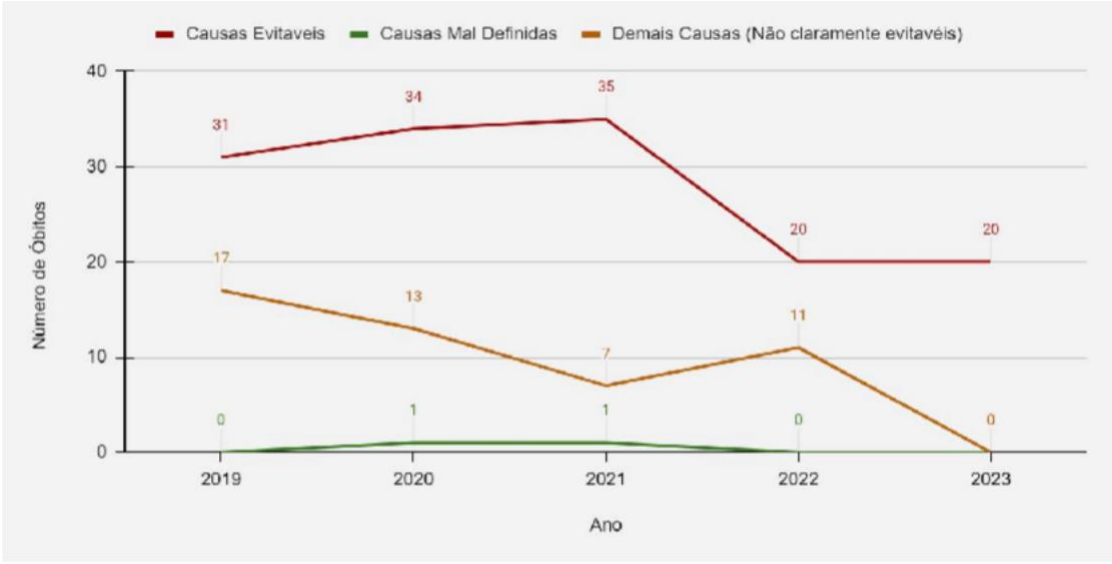


Source: DATASUS - SIM - Mortality Information System

Preventable causes of infant death are those that could be prevented through effective public health interventions, social policies, and adequate access to health care. It is important to note that while the risk of infant mortality can vary by age group, many infant deaths are preventable with adequate access to health care and preventive interventions. Focusing on promoting maternal and child health and preventing illness and injury is critical to reducing the risk of infant death at all ages.

When we evaluate the number of deaths in relation to avoidable causes, we can show that the number of deaths closed with avoidable causes represents the majority of deaths in the entire period between 2019 and 2023 as shown in graph 09.

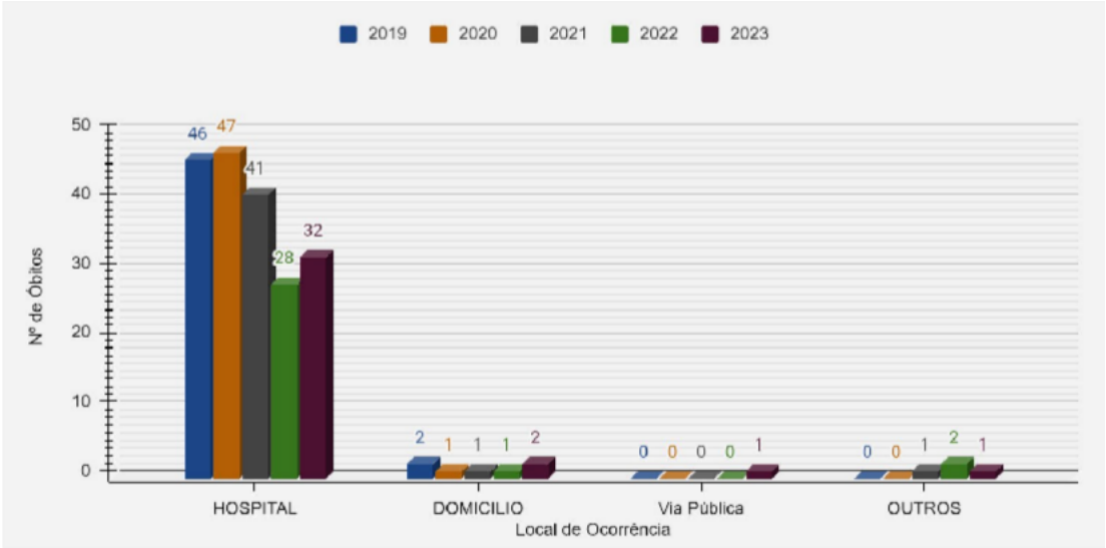
Graph 09: Number of infant deaths that occurred in Rio Verde - GO in the years 2019 to 2023 according to preventable causes.



Source: DATASUS - SIM - Mortality Information System

Of the 207 deaths that occurred in children under 1 year of age living in the municipality of Rio Verde between 2019 and 2023, 194 (93.72%) deaths occurred in hospital units, maintaining them as prevalent in relation to the places of occurrence of death during all years of the period evaluated. In relation to the other places listed, home and public roads, 2 records of infant deaths at home were found in 2019 and 2023, 1 death record in 2020, 2021, 2022 respectively and, in relation to deaths that occurred on public roads, we had 1 record in 2023 as observed in graph 10.

Graph 10: Number of infant deaths that occurred in Rio Verde - GO in the years 2019 to 2023 according to the place of occurrence of death.



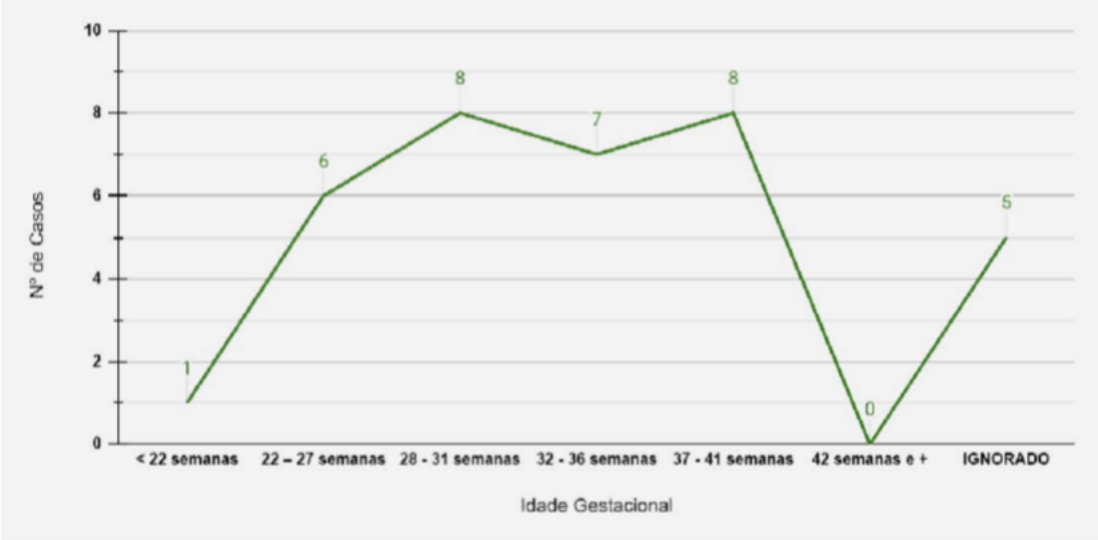
Source: DATASUS - SIM - Mortality Information System

Unfortunately, infant death is a serious and complex issue in many countries, including Brazil. In 2023, the analysis of the infant death profile in Brazil would likely

consider a variety of factors that contribute to this sad reality. In summary, a comprehensive analysis of the infant death profile in the municipality of Rio Verde - GO required a careful evaluation of a variety of factors, including causes of death, access to health care, socioeconomic conditions, government interventions, and regional and cultural challenges. This information is essential to inform health policies and programs aimed at reducing infant mortality and improving the well-being of families in Rioverde and, for this reason, this study was developed based on a temporal analysis of the last 5 years and later a mirror of the year 2023 with the analysis of the epidemiological profile obtained.

When we evaluate the profile of infant deaths that occurred in Rio Verde – GO in 2023 related to the child's gestational age, we can observe that an incidence of deaths occurred in situations where the child had a gestational age between 28 and 31 weeks and 37 to 41 weeks.

Graph 11: Number of infant deaths in Rio Verde - GO in 2023 according to gestational age.

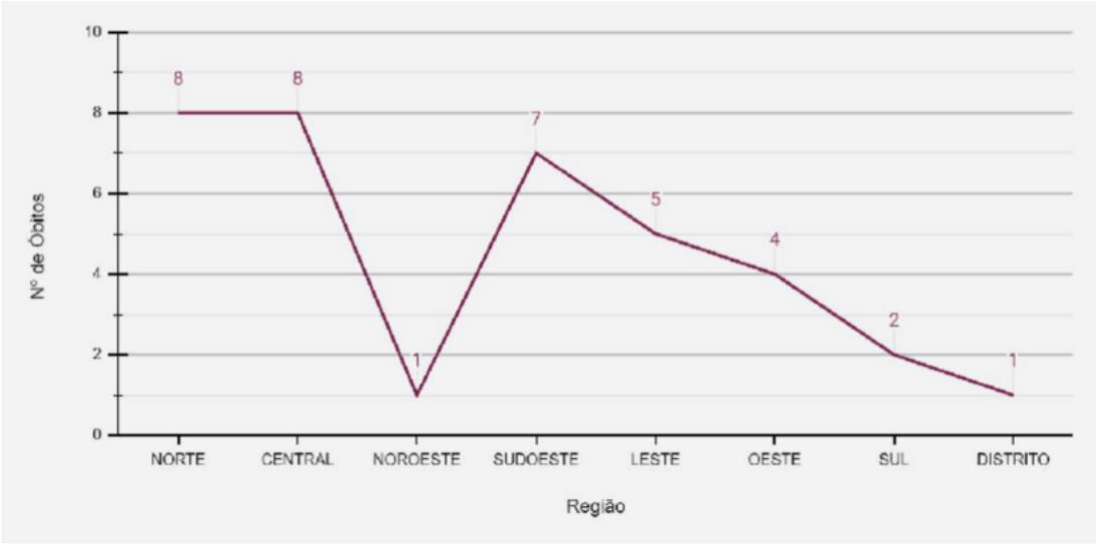


Source: DATASUS - SIM - Mortality Information System

The epidemiological profile of infant death can vary significantly according to the region of residence due to a number of factors, including access to health care, nutrition, socioeconomic conditions, public health policies, and cultural practices, as all these factors contribute to the reduction of infant mortality rates. Effective interventions can vary depending on the specific needs of each region.

As shown in Graph 12, the poorest regions of the municipality of Rio Verde – GO, such as the North, Central and Southeast regions, represent the highest incidence of infant deaths in relation to the other regions.

Graph 12: Number of infant deaths that occurred in Rio Verde - GO in 2023 according to the region of residence.



Source: DATASUS - SIM - Mortality Information System

The International Classification of Diseases (ICD) is a fundamental tool for understanding and analyzing the causes of infant death. It offers a standardized framework for classifying and recording diseases, medical conditions, and causes of death worldwide. The analysis of the causes of infant death according to the ICD allows the identification of patterns, trends and priority areas for intervention and prevention of new deaths. As a result, we analyzed the main causes of infant death in 2023 in Rio Verde – GO, according to the ICD, and we can observe that the three main causes of infant death in the analyzed period were: some conditions originating in the perinatal period, representing 50%, Congenital malformation, deformity, and chromosomal abnormalities, representing 16.67%, and Diseases of the respiratory system, representing 13.89%, as shown in table 02 below.

Table 02: Number of infant deaths in the municipality of Rio Verde – GO in 2023 according to the description of the main causes of death by ICD chapter in children under 1 year of age.

CAUSE OF DEATH BY ICD CHAPTER	No.	%
Some infectious and parasitic diseases	1	2,78
Genitourinary system disorders	1	2,78
External causes of morbidity and mortality	1	2,78
Sint sinais e achad anorm ex clín e laborat	2	5,56
Nervous system disorders	2	5,56
Diseases of the respiratory system	5	13,89
Malf cong deformid and chromosomal abnormalities	6	16,67
Some afec. originated in the perinatal period	18	50

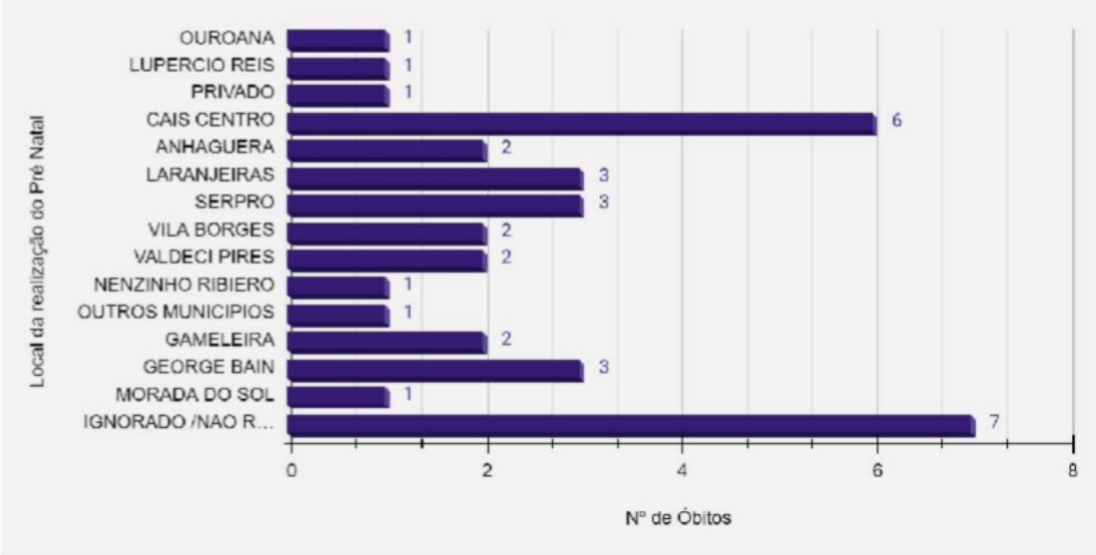
Source: DATASUS - SIM - Mortality Information System

Prenatal care plays a key role in reducing the number of infant deaths, as it offers a series of benefits for both mother and baby as it helps to identify complications in pregnancy

early, promotes healthy habits, allows for early diagnosis and management of medical conditions, and prepares the mother and family for childbirth and newborn care.

The analysis of this variable is essential for the development of actions to prevent complications during pregnancy and reduce the number of infant deaths. In graph 13, we can see that the place with the highest number of visits to mothers of children under 1 year of age during the gestational period and who progressed to death was the CAIS Centro unit. This number may be closely linked to the profile of patients directed to the unit already at risk of complications. During the analysis, it was also possible to observe fragility in relation to data recording, as it was evident that the record of the place where prenatal care was performed was included as unknown/not performed.

Graph 13: Number of infant deaths that occurred in Rio Verde - GO in 2023 according to the place where prenatal care was performed.



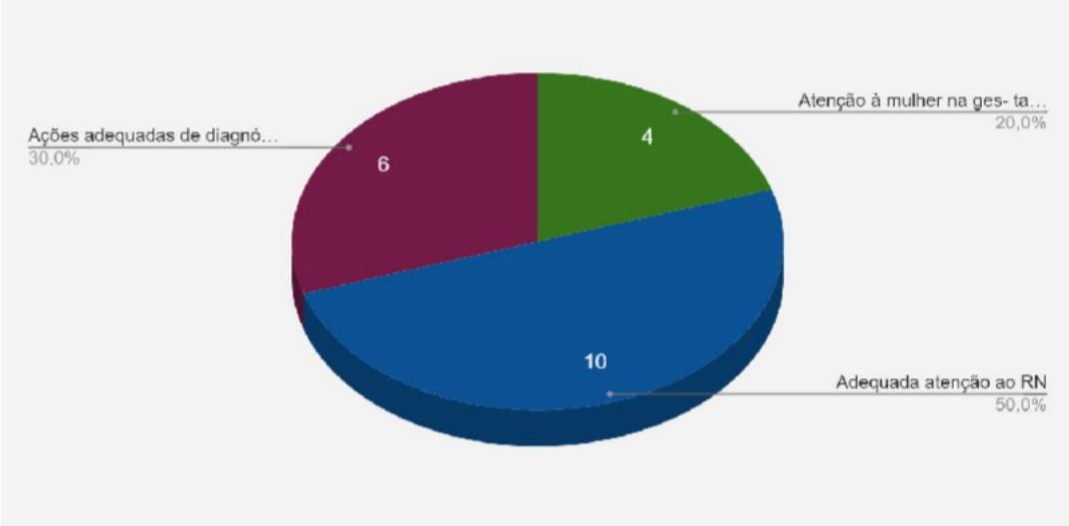
Source: DATASUS - SIM - Mortality Information System

Avoidability actions classify deaths that could be avoided through appropriate medical interventions, care for pregnant women during prenatal care, or changes in the health system. Avoidability actions may vary according to the reality of each municipality or region and, as a result, the analysis of this variable helps to identify avoidability actions according to the profile of the municipality and to identify priority areas. These categories help identify priority areas for intervention and prevention in reducing child mortality.

When we evaluate the profile of the municipality of Rio Verde – GO in relation to the number of deaths in relation to avoidability actions, we can observe that the main actions were attributed to adequate care to the newborn – Newborn, representing 50% of the deaths after the investigation, followed by 30% of the cases related to adequate diagnostic actions and 20% related to care for women during pregnancy.

With this, we can evidence that the city of Rio Verde has advanced in relation to care for women during pregnancy, but it is still necessary to study strategies focused on adequate care for newborns.

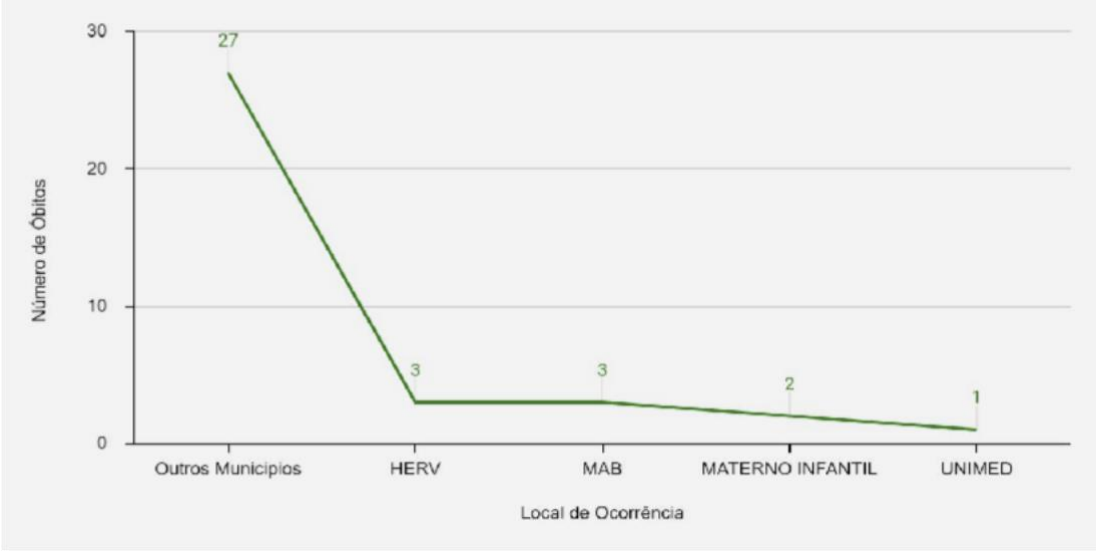
Graph 14: Number of infant deaths that occurred in Rio Verde - GO in 2023 according to avoidability actions.



Source: DATASUS - SIM - Mortality Information System

When we analyze the place of occurrence of infant death in the municipality of Rio Verde - GO, we can observe that the vast majority of deaths, about 75%, occurred in other municipalities. These data can be related to the information presented above, in graph 14, which describes the care of newborns as the main preventability action of infant deaths in children under one year of age.

Graph 15: Number of infant deaths that occurred in Rio Verde - GO in 2023 according to the place of death.



Source: DATASUS - SIM - Mortality Information System

In order to talk about maternal death and death of a woman of ferti age - MIF, we first need to understand the definition of the two terms. MIF - Woman of Childbearing Age refers to women who are at the stage of life where they are able to conceive and give birth to a child. Generally, the age range considered as childbearing age is defined as the age between puberty and menopause. Maternal death, on the other hand, refers to the death of a woman during pregnancy, childbirth or within a period of up to 42 days after the end of pregnancy, regardless of the duration and location of the pregnancy, due to any cause related to or aggravated by pregnancy or childbirth, but not from external causes, such as accidents, diseases unrelated to pregnancy or violence.

Therefore, understanding the maternal and childbearing age death profile involves considering a wide range of social, economic, cultural, and health factors that influence during these critical periods. During the investigation of deaths that occurred in Rio Verde – GO in 2023, it was possible to identify 71 MIF deaths and 1 maternal death. The maternal death is from causes unrelated to pregnancy, registered as AMI – Acute Myocardial Infarction and occurred at the health unit Hospital Municipal Universitário de Rio Verde - HMURV.

Table 03: Number of maternal deaths and deaths of women of childbearing age that occurred in Rio Verde – GO in 2023.

DEATH INVESTIGATION OF MIF – WOMAN OF CHILDBEARING AGE	
Number of deaths MIF – Woman of childbearing age	71
Number of maternal deaths in total (Early and late)	1
Number of maternal deaths identified after investigation	1
Number of maternal deaths from 43 days to 1 year after delivery	1
Maternal death ratio per 100 live births (MMR)	0.01/100 live births
Name of the institution where the death occurred	HMURV
Causes of maternal death	AMI – Acute myocardial infarction

Source: DATASUS - SIM - Mortality Information System

The infant and fetal mortality coefficients are important indicators used to assess the health and well-being of the population, especially in relation to maternal and child health. These coefficients are important tools for health professionals and public managers to monitor and evaluate the effectiveness of maternal and child health policies, in addition to guiding the allocation of resources to areas where infant and fetal mortality is higher.

Analyzing the infant and fetal mortality coefficient indicator in the municipality of Rio Verde – GO in 2023, it was evidenced that the indices presented for the fetal mortality coefficient (12.71%) is slightly higher than the infant mortality coefficient (10.90%).

Table 04: Coefficient of infant and fetal death in Rio Verde – GO in 2023.

INFANT AND FETAL MORTALITY COEFFICIENT		
LIVE BIRTHS	FETAL	INFANTI
	3.302	L 3.302
NUMBER OF DEATHS	FETAL	INFANTI
	42	L
MORTALITY COEFFICIENT	FETAL	36
	12,71%	10,90%

Source: DATASUS - SIM - Mortality Information System

DISCUSSION AND CONCLUSION

According to Brasil (2009), infant mortality directly affects the conditions of environmental infrastructure, socioeconomic development, access and quality of resources available for maternal health care and the child population, and can be prevented through the development of studies to survey the needs of each region, in a unique way, and thus carry out interventions and create strategies that reduce this mortality.

Potrich et al. (2011) mention that the child's weight, the type of delivery and the mother's education directly influence the infant mortality figures. The investigation of deaths contributes to the improvement of records and enables the adoption of preventive measures and is part of the strategy to reduce mortality rates in the country (BRASIL, 2019).

The variables related to infant mortality in the city of Rio Verde were mostly associated with deaths that occurred in boys, of brown color, with birth weight below normal, whose mothers were young, with good schooling and who had a single pregnancy, born vaginally, which occurred in public health units.

According to BRASIL (2022), primary care coverage in the municipality of Rio Verde in December 2015 was 35.30%, 2016 and 2017 45%, and in 2018 and 2019 51%. Thus, one of the hypotheses that can be raised in the municipality in relation to this increase in infant deaths that have occurred in recent years is in relation to health care.

Oliveira (2013) shows that in order to have adequate and quality prenatal care, it is also necessary to improve infrastructure, physical, material, human and financial resources, multidisciplinary care, guidance and conduct, which would make promotion and prevention actions positive. Therefore, it is necessary not only a professional qualification, but also a

mobilization of the professionals involved in this network, in addition to an adequate investment of managers in the Maternal and Child Health sector in order to allow efficient actions and strategies for the system.

In summary, it is notorious that there has been a reduction in infant mortality in recent years in the municipality of Rio Verde. However, although it has been an advance for public health, even with positive changes in relation to the health of mothers and children, infant mortality remains a substantial concern within public policies.

CONCLUSION

In view of the results presented in this study on infant mortality in the city of Rio Verde - GO, it is clear that there is a need to adapt public health strategies to the specificities of the epidemiological profile of the local community. Interventions should consider available resources, health infrastructure, and the socioeconomic characteristics of the population, ensuring a more effective approach to reducing infant mortality rates.

One of the main recommendations is continuous investment in improving access to and quality of maternal and child health care. This includes ensuring adequate prenatal care for all pregnant women, the presence of qualified professionals at the time of delivery, and the availability of appropriate postnatal care. The promotion of maternal and child health, through awareness campaigns on the importance of prenatal care, safe delivery, breastfeeding, adequate nutrition and immunization, should also be intensified.

The study also highlights the importance of training health professionals, especially those involved in neonatal care, since most infant deaths occur during the first month of life. To this end, it is essential to ensure access to appropriate equipment and medicines and to integrate maternal and child health services with other programs, such as nutrition, mental health, infectious disease prevention, and family planning.

In addition, promoting evidence-based care and carrying out continuous monitoring and evaluation of health indicators are indispensable actions for the early detection of problems and the adoption of effective corrective measures. Strict monitoring of indicators, such as infant mortality, vaccination coverage, and number of live births, will enable more targeted and efficient interventions.

The role of nursing professionals in the surveillance of infant mortality is also a highlight. These professionals must be trained and updated to monitor the main causes of death and contribute to the organization of work processes, with emphasis on improving the care offered to pregnant women and newborns in health units.

Finally, improving the quality of epidemiological surveillance information, through the proper completion of death certificates and hospital records, is crucial to ensure reliable data that can guide strategic actions. The commitment to improving the quality of health services, associated with the coordinated effort between the government, health professionals and the community, is essential to promote a significant and sustainable reduction in infant mortality rates in the municipality of Rio Verde - GO.

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