

Article

Effect of Education on Adherence to Recommended Prenatal Practices among Indigenous Ngäbe–Buglé Communities of Panama

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Abstract: *Background and Objectives:* The primary objective of this study was to assess the adherence of Ngäbe–Buglé women to WHO-recommended prenatal practices. The secondary objective was to compare adherence levels between women who received prenatal education from official medical providers and those educated through traditional or community-based sources within Ngäbe–Buglé communities. *Materials and Methods:* An eight-question survey was verbally administered to 137 Ngäbe–Buglé women at clinics set up by the non-profit NGO Floating Doctors in eight communities. A two-sided Fisher’s Exact test with a $p = 0.05$ was used to compare the results of mothers who received prenatal education from evidence-based sources to other groups. *Results:* Out of the 137 surveyed women, 65 reported taking prenatal vitamins, 21 had prenatal check-ups, 136 avoided alcohol, 31 increased caloric intake, and 102 maintained their activity levels. Significant differences were observed in prenatal vitamin adherence between those educated by official sources versus unofficial sources ($p = 0.0029$) and official sources compared to those with no prenatal education ($p < 0.0001$). The difference was also significant for education from an unofficial source versus no education ($p = 0.0056$). However, no significant differences were found in other prenatal practices based on education sources. *Conclusions:* Our findings highlight deficiencies in both prenatal education and adherence to recommended practices among Ngäbe–Buglé women. Prenatal education significantly improved adherence to taking prenatal vitamins, suggesting its effectiveness as an intervention. Future interventions should prioritize culturally competent prenatal education and address barriers to accessing prenatal healthcare in Ngäbe–Buglé communities.

Keywords: indigenous peoples; prenatal care; prenatal education; maternal and child health; Panama health



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1. Introduction

Panama is home to seven groups of Indigenous peoples, who make up 12.3% of the country’s population [1]. There are six nationally recognized comarcas, or regions that are inhabited by Indigenous peoples. These comarcas function as semi-autonomously governing provinces. The Ngäbe and the Buglé peoples share a comarca and together make up over half of the Indigenous peoples in Panama. Not only are the Ngäbe–Buglé the largest Indigenous population, but they also are the poorest [2]. A total of 80% of Ngäbe–Buglé people live below the poverty line, compared to 20% of the national population. Additionally, most Indigenous peoples in Panama are significantly underserved medically; there is only one nurse and 1.4 physicians per 10,000 people in the remote Ngäbe–Buglé comarca [3]. Limited providers and inadequate access to healthcare are believed to contribute to several discouraging statistics in the Ngäbe–Buglé community. Ngäbe–Buglé

peoples, when compared to non-Indigenous Panamanian peoples, have a nearly 10-year lower lifespan, a rate of infant mortality double that of their non-Indigenous counterparts, and a rate of maternal mortality triple that of their non-Indigenous counterparts [3–7].

The combination of high fertility rates, increased risk of maternal and infant mortality, and lack of healthcare access poses a substantial risk to Ngäbe–Buglé people [7]. These concerns are shared by many Indigenous peoples globally, with near-ubiquitous evidence of poorer health outcomes compared to non-Indigenous peoples [8]. In 2011, in an attempt to close this gap, the US-based Floating Doctors NGO began providing free healthcare by boat and by foot to around 30 communities in the Bocas del Toro region and Ngäbe–Buglé comarca [9]. It is only possible for Floating Doctors to return to each community every three months; therefore, it is crucial to educate communities on preventative and healthy practices to reduce the burden of healthcare needs that are preventable through patient education and empowerment. A significant area of intervention may include providing effective education on recommended prenatal care practices. Maternal knowledge of correct prenatal care practices correlates with better maternal and fetal outcomes [10–12]. The World Health Organization’s recommendations on prenatal care for a positive pregnancy experience include but are not limited to eating an adequate diet, maintaining a physical activity level, taking daily prenatal vitamins that include folic acid, avoiding alcohol, tobacco, and other substance use, and receiving a minimum of four check-ups with a healthcare provider [10]. Many adverse pregnancy outcomes can be prevented by adhering to these recommended prenatal practices.

While the lack of medical service in rural Indigenous communities is believed to contribute to negative maternal and infant outcomes, the lack of prenatal education may be a modifiable contributor to these poor outcomes. Targeting health education to improve healthcare outcomes is more attainable than attempting to alter physical barriers to healthcare in Indigenous communities. In a study conducted by researchers at the University of Virginia, Panamanian women scored significantly lower in most domains of prenatal care knowledge and simultaneously had double the rates of infant mortality when compared to neighboring Costa Rican women [13]. While this study establishes that increased prenatal knowledge may correlate with better health outcomes, it does not address how education influences the types of prenatal practices followed by mothers, nor does it specifically address the impact of various educational sources. In addition, other studies show that there is a lack of community participation in educational programming involving the topics of pregnancy, prenatal care, family planning, and breastfeeding in the Ngäbe–Buglé communities [14,15]. This raises the concern of whether proper prenatal education is reaching remote Indigenous communities.

Observation of the Ngäbe–Buglé communities shows that prenatal education is disseminated in various ways. Individuals may receive education from an official provider like the Floating Doctors or the Panamanian Ministry of Health (MINSAs), or women may receive education from local sources such as family members or community members [9,16]. Some women may not have received any prenatal education at all.

Family members often pass down unofficial advice by word of mouth or use traditional familial prenatal practices. Community members, including friends, neighbors, local “midwives” (parteras), and teachers, also appear to share prenatal information largely as unofficial advice. While this advice has value and incorporates local traditions and experience, it is not always supported by medical evidence and up-to-date recommendations. Ngäbe–Buglé schools do not have a prenatal curriculum; however, a previous study interviewing adolescents in two Ngäbe–Buglé communities revealed that sexual and reproductive health education was commonly provided by teachers [17]. This education from teachers is community-dependent, not a formal curriculum, and is subject to bias and misinformation. Additionally, because sexual education is not mandated and many adolescents do not attend high school, numerous individuals never have exposure to sexual or reproductive health.

Floating Doctors Organization focuses on providing evidence-based prenatal education when seeing patients during their clinic [9]. Medical providers who are trained in official recommended practices verbally disseminate information to pregnant women who attend the clinics. Providers answer patient questions, address patient concerns, and offer medical advice within the scope of current guidelines. Floating Doctors also hosts an annual day to educate midwives (parteras) from surrounding Ngäbe–Buglé communities. During this session, midwives are educated on normal pregnancy milestones, warning signs during pregnancy, breastfeeding practices, and prenatal practices such as taking prenatal vitamins and seeing medical providers. Unfortunately, within the communities, midwives are traditionally only utilized when a woman is going into labor or beginning to breastfeed and not used throughout pregnancy.

The Panamanian Ministry of Health is an additional source through which women can receive evidence-based prenatal education [16]. Women can travel to a regional hospital to receive official gynecological and obstetric care from MINSA. Depending on the location of one's community, accessing these hospitals can take many hours of expensive travel by boat, foot, and vehicle. In less remote communities, there are small health centers that can provide basic care such as vital signs, vaccinations, and vitamins, but these clinics do not provide complex obstetric and gynecological care.

Although there are several sources of education available in these Indigenous communities, the rates of maternal and infant mortality remain elevated when compared to the general Panamanian population. Consequently, it is imperative to discern the underlying factors contributing to this disparity. While physical barriers to healthcare are present and somewhat unbudging, the dissemination of adequate education stands out as a modifiable determinant of health. Therefore, there is a pressing need to explore the nature of the educational content provided, its sources, and its effectiveness in positively influencing prenatal outcomes.

The primary objective of this study is to discern which WHO-recommended prenatal practices are followed by Ngäbe–Buglé women. This will help identify areas for improvement and specify future topics for education. The secondary objective is to compare the adherence of patients to WHO-recommended prenatal practices between groups who received prenatal education from official medical providers and those who received education from traditional or community-based sources within Ngäbe–Buglé communities or no education at all. Through this comparison, we seek to assess whether official education disseminated by a provider can lead to better adherence to WHO-recommended prenatal practices.

2. Materials and Methods

Inclusion criteria consist of women above 18 years of age living in an Indigenous Ngäbe–Buglé community who are currently pregnant and/or had been pregnant in the past and consented to participate. Participants were recruited at eight different Ngäbe–Buglé communities in Bocas del Toro, Panama, while attending Floating Doctor's mobile healthcare clinics. Women who were waiting to be seen by physicians were approached. Individuals who consented were verbally administered the survey in Spanish away from other patients for privacy. Of the 165 individuals approached, a total of 137 women participated in an anonymous, eight-question survey verbally administered by members of the research team regarding prenatal education and previous or current prenatal practices (response rate of 83%). Participants were asked if they received any form of prenatal education or advice and which source they received it from, including a family member, community member, Floating Doctors, or the Panamanian Ministry of Health. Participants were then asked about pregnancy habits, including if they took prenatal vitamins, avoided alcohol, increased their caloric intake, maintained their exercise level, and received check-ups.

The survey responses were recorded on paper and totaled. Fisher's exact test was used to determine if there was a significant association between prenatal education and prenatal practices followed using GraphPad Prism version 9.0.0 for Mac, Graphpad Software, Boston,

MA, USA, www.graphpad.com. Data were statistically analyzed with a two-sided test at a p-value of 0.05. This study was approved by the Panamanian Ministry of Health and the IRB. Drexel University Office of Innovation and Research via IRB committee 3 (Protocol# 2206009307).

3. Results

A total of 137 participants were reached by the survey. Compliance with each prenatal practice per patient was recorded and categorized (Figure 1).

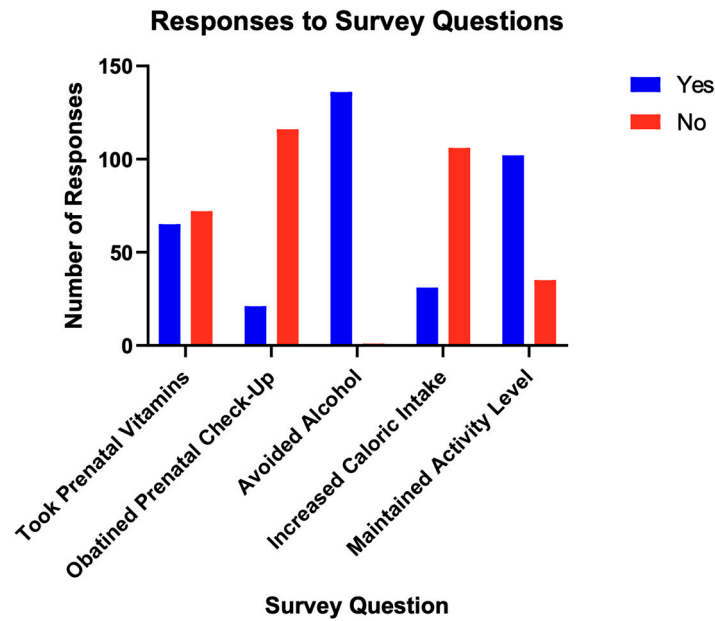


Figure 1. Total Responses to Survey Stacked Bar Graph. Categories of compared responses include Took Prenatal Vitamins (65Y, 72N), Obtained Prenatal Check-up (21Y, 116N), Avoided Alcohol (136Y, 1N), Increased Caloric Intake (31Y, 106N), Maintained Activity Level (102Y, 35N).

Each woman who responded to the survey described where she received her prenatal education. Ngäbe–Buglé women acquired prenatal education from a variety of sources (Figure 2).

Source of Prenatal Education

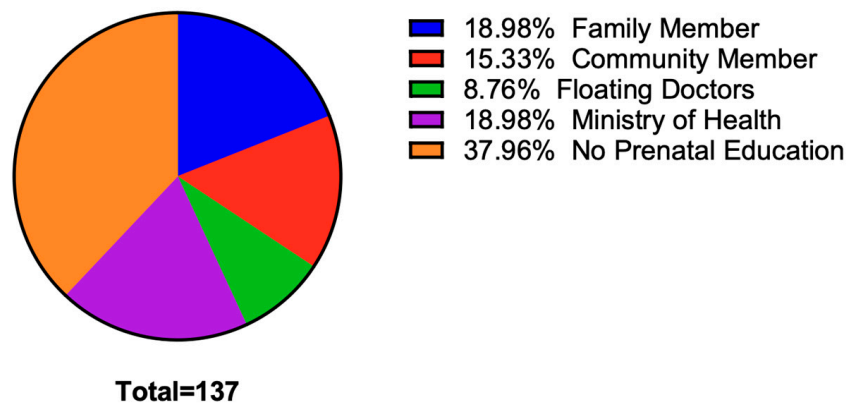


Figure 2. Source of Prenatal Education Pie Chart. Sources of prenatal education include family members (26), community members (21), Floating Doctors (12), Ministry of Health (26), or no education (52).

These sources were further organized into categories of education from an official provider (Floating Doctors or MINSA), education from unofficial local sources (family member, community member), or no education at all (Table 1). Official providers were such providers who practiced evidence-based medicine and endorsed the WHO-recommended prenatal practices.

Table 1. Total Response to Survey Questions by Education vs. No Education.

	Took Prenatal Vitamins		Obtained a Prenatal Check-Up		Avoided Alcohol		Increased Caloric Intake		Maintained Activity Level	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Official Education	31	7	8	30	38	0	12	26	28	10
Unofficial Education	23	24	3	44	47	0	11	36	31	16
No Education	11	41	10	42	51	1	8	44	43	9

The rows compare survey question responses of those who have received official prenatal education (38) to those who received unofficial education (47) to those who did not receive any type of prenatal education (52).

Ngäbe–Buglé women who received prenatal education from an official healthcare provider were significantly more likely to report taking prenatal vitamins during pregnancy (Figure 3). However, receiving education from an official source did not lead to a significant difference in the number of positive responses in any other category.

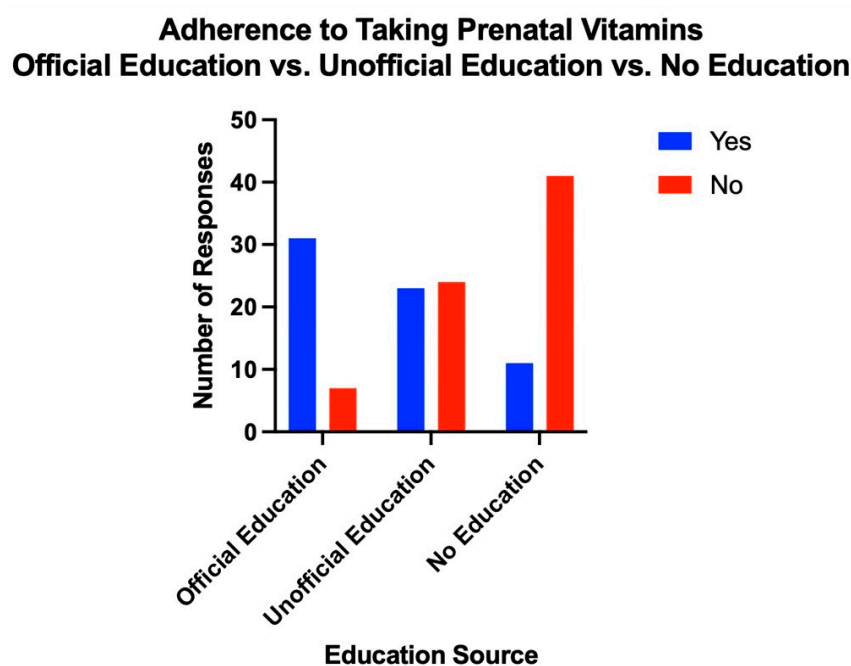


Figure 3. Adherence to Taking Prenatal Vitamins Stacked Bar Graph. Categories of compared responses include those who have received official education (31Y, 7N), those who received unofficial education (23Y, 24N), and those who did not receive any type of prenatal education (11Y, 41N). The difference in totals was found to be statistically significant ($p < 0.0001$).

Because adherence to taking prenatal vitamins appears to be associated with receiving official prenatal education, the education category was stratified into sources of education and responses per source (Figure 4). This organization aids in identifying the most effective source for educating women, serving as a model for future educational interventions.

Adherence to Taking Prenatal Vitamins in Groups Educated by Various Sources

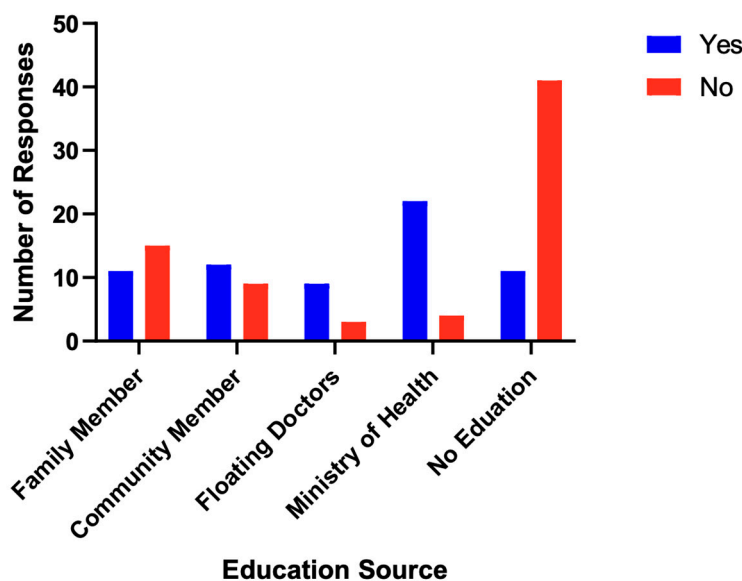


Figure 4. Adherence to Taking Prenatal Vitamins in Groups Educated by Various Sources Stacked Bar Graph. The yes or no responses of participants to taking prenatal vitamins during pregnancy were compared by source of education received, including those who were educated by an unofficial source such as family member (11Y, 15N) or community member (12Y, 9N), those who were educated by an official source such as the Floating Doctors (9Y, 3N) or Ministry of Health (22Y, 4N), and those who received no education at all (11Y, 41N).

4. Discussion

It is imperative to recognize the inherent limitations of this study. The scope of our data collection was constrained by the size of our sample. A larger sample size holds the potential to yield more extensive results, thus potentially leading to more statistically significant outcomes. As only women who attended Floating Doctors clinics were recruited, sampling bias may be present. These women may have been more cognizant of their health than women who did not attend. There is also the potential for recall bias as the study included women who had been pregnant in the past in addition to those who were currently pregnant. Additionally, variations in the geographic location of each population surveyed and the socioeconomic status of each community may affect how each woman reported her adherence. Lastly, women elected to participate in the survey, allowing for self-reporting bias, and some degree of interviewer bias should be assumed as the survey was conducted orally.

Furthermore, various confounding factors complicated our study's interpretation. Notably, the distribution of prenatal vitamins to patients free of charge at official healthcare providers such as the Floating Doctors or MINSAs introduces ambiguity regarding the reason behind improved adherence to taking prenatal vitamins among individuals with official education. Determining whether this increase in adherence to taking prenatal vitamins stems from enhanced education or available access to free vitamins presents a challenge. Other confounding factors are present in the study as well. It is difficult to determine whether a patient's failure to maintain an adequate activity level is attributable to educational deficiencies or due to inherent challenges associated with Indigenous women's living circumstances. Ngäbe–Buglé women often bear the burdens of household and childcare responsibilities, which can be physically demanding. Many Indigenous women lack the autonomy to adjust their activity levels during pregnancy due to the physical hardships inherent in their communities. Further confounding factors were evident in other aspects of the study as well. External factors may account for low adherence to

dietary recommendations. Women in Ngäbe–Buglé communities have limited access to nutritious foods and often face conflicting recommendations by healthcare providers due to commonplace obesity [18]. Most communities have access to cheap processed foods and beverages with high caloric, sugar, and fat content [19]. Increasing consumption of these goods is not recommended during pregnancy or at any time; therefore, women may avoid changing their diet. Other confounding factors may have more to do with societal norms, financial constraints, and limited access. This is likely the case when considering the low alcohol consumption among Ngäbe–Buglé women, regardless of pregnancy status. While alcohol consumption may vary by community, the observed general abstinence among women can be attributed to cultural taboos, financial burdens, and logistical challenges rather than appropriate education. Finally, Indigenous women's limited access to long-distance transportation and lack of local healthcare services may have hindered their ability to attend check-ups, irrespective of their intent or awareness. This, again, may confound our data. Previous research has highlighted the negative impact of distance on the utilization of prenatal, childbirth, and postpartum care services among the Ngäbe–Buglé population, underscoring distance as a significant barrier to care [5]. Although initiatives like the Floating Doctors mobile clinics alleviate some of these challenges by providing basic healthcare services and medications, mobile clinics cannot deliver comprehensive prenatal care, including ultrasound examinations. Overall, several limitations are intrinsic to this study and must be considered closely when drawing conclusions.

Portions of the study did result in statistically significant data. There was a notable difference in adherence to taking prenatal vitamins between those who received education from an official source versus those who were educated by an unofficial source ($p = 0.0029$). Additionally, there was a true difference in adherence to prenatal vitamin consumption between those who received official education and those who received no education at all ($p < 0.0001$). Finally, there was even a difference in adherence to prenatal vitamin usage between those who received education from an unofficial source and those who received no education ($p = 0.0056$). These data reveal that prenatal education from any source may make a significant difference in adherence to prenatal vitamin consumption in Ngäbe–Buglé communities. In particular, official education offered the greatest increase in adherence when compared to any other category. While the confounding factor of free vitamins at official clinics was addressed earlier, prenatal vitamin use still increased significantly among women who received education from sources that did not give away free vitamins. This is encouraging. Additionally, there are fewer environmental or cultural barriers for Ngäbe–Buglé women to take prenatal vitamins than in other categories surveyed. Therefore, it is promising that within this category, there was a statistically significant difference in a woman's choice to take prenatal vitamins, highlighting the positive impact of prenatal education when barriers are alleviated. When interpreting the other categories, there were no statistically significant differences in the number of participants adhering to a certain prenatal practice based on the source of education received. This lack of statistical significance may be attributed to multiple intrinsic barriers to prenatal care present in an Indigenous community that impede adherence to prenatal practices regardless of a woman's choice or desire to do so.

Ultimately, a large issue lies in the observation that patients are receiving prenatal education but do not exhibit behavioral modifications. Almost half of the Indigenous women surveyed are consulting healthcare professionals and receiving evidence-based recommendations. However, their adherence to most recommended prenatal practices is no different than those who did not receive this official education. To offer insight into the outcome of this study, parallel literature may be examined. Existing studies indicate that prenatal education initiatives can yield positive outcomes in Indigenous and rural communities. A study in Canada in 2016 demonstrated that community-led educational programming for Indigenous populations was linked to a positive change in birth outcomes, access to pre and postnatal care, prenatal street drug use, breastfeeding, dental health, infant nutrition, and child development [20]. A more recent study in 2021 demonstrated

that remote prenatal education in Canada is feasible and effective for improving the breastfeeding rate and engaging pregnant women to participate in prenatal programming in rural communities [21]. Nonetheless, programs can fall short of achieving desired results. Ineffectiveness frequently stems from a lack of inclusivity and specificity tailored to the target population. This was seen in a 2021 study that demonstrated that educational reproductive health interventions for adolescents in Indigenous Inuit communities were not effective. The study suggested incorporating culturally appropriate programming in future interventions [22]. Moreover, the absence of cultural competence in conveying medical information may even deter participation from Indigenous communities. This was the case in a 2022 study that included Indigenous peoples from New Zealand, Australia, Canada, and the United States. This study demonstrated that little consideration is afforded to the specific antenatal health needs and aspirations of Indigenous populations. This manuscript also suggested that targeted interventions should further consider culture, language, and wider aspects of holistic health [23].

While evidenced-based prenatal education shows potential in Indigenous communities, the way it is delivered is just as pivotal as the content itself. The current format of education in the Indigenous communities of Bocas del Toro may not resonate effectively with Ngäbe–Buglé women. Thus, educators must curate culturally integrated and sensitive educational approaches that align with Indigenous cultural norms. Additionally, delivering education in local languages such as Ngäbere and Buglere, as opposed to Spanish, could enhance acceptability and understanding within this demographic. Ultimately, this study serves as a springboard for scrutinizing the presentation of prenatal education among Indigenous women in Ngäbe–Buglé communities. In addition to the way prenatal education is presented, the barriers discussed previously are still very present and real in these communities. While prenatal education continues to be reformed and improved, we must also make sure to address the inequality in access to healthcare among Indigenous populations. Barriers, whether they be monetary, environmental, cultural, or physical, must be addressed at a higher level to improve maternal and infant health outcomes.

5. Conclusions

In conclusion, our study provides insight into the relationship between the source of education and adherence to recommended prenatal practices among the Indigenous Ngäbe–Buglé women in Panama. Overall, there are shortcomings in adherence to WHO-recommended prenatal practices within the Ngäbe–Buglé communities and inadequacies in prenatal education teachings across most studied categories. Although the lack of proper prenatal care is prevalent, the positive association found between a mother who received prenatal education from any source and her choice to take prenatal vitamins provides reassurance that prenatal education can indeed improve maternal and fetal outcomes. Despite the positive impact of education on prenatal vitamin adherence, prenatal education from either official or unofficial sources did not significantly influence other recommended prenatal practices. This lack of educational influence may be attributed to the significant barriers faced by Indigenous women and the deficiency in culturally competent forms of prenatal education that hinder the translation of prenatal education into behavioral change. These barriers include limited access to healthcare facilities, lack of nutritious food, cultural norms, socioeconomic constraints, and demands of living in an Indigenous village. The limitations and confounding variables identified in our study underscore the complexity of addressing prenatal health disparities in Indigenous communities.

Future interventions should not only focus on increasing the delivery of evidence-based prenatal education to Indigenous communities but also on tailoring the way it is delivered. According to previous literature, the presence of culturally competent education is crucial. This includes aligning education with cultural norms and utilizing local dialects when providing evidence-based medical education. This may be accomplished through reaching trusted schoolteachers and midwives (*parteras*) throughout the community who can disseminate prenatal information that is better received and more widely dispersed.

In addition to partnering with more parteras in the communities, training more parteras through Floating Doctors can also potentially improve healthcare outcomes. Floating Doctors hosts an annual day for parteras in the surrounding communities at their local base, and this is a potential for educational intervention. Although the parteras are not licensed medical providers, they are community members who are called upon for their experiences with birth. Currently, there is around one partera for every three communities, so increasing this number through education can be another potential intervention. Subsequent investigations should delve deeper into how prenatal education is delivered and whether recipients perceive healthcare providers' teachings as suitable for their cultural context and comprehension. If so, it is important to continue to analyze this education and its effectiveness. It is also crucial for providers to recognize the significant barriers to improved health outcomes that are present for pregnant Indigenous women and work alongside the government and volunteer organizations such as the Floating Doctors to alleviate these. Above all, positive relationships and cooperation between providers and the Ngäbe–Buglé community should continue to be maintained and fostered to promote positive health outcomes. Overall, our study serves as a catalyst for further research and educational intervention strategies aimed at improving maternal and infant health outcomes in Indigenous populations. By addressing the barriers faced by the Ngäbe–Buglé communities, we can strive towards achieving equitable and effective prenatal care for all Indigenous populations.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: All data are available within this article.

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