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ASSESSMENT OF COMMUNITY PARTICIPATION AND SOCIODEMOGRAPHIC CONDITIONS IN THE DETECTION OF CONGENITAL EYE MALFORMATIONS IN THE ISTHMUS OF TEHUANTEPEC, OAXACA, MEXICO

EVALUACIÓN DE LA PARTICIPACIÓN COMUNITARIA Y CONDICIONES SOCIODEMOGRÁFICAS EN LA DETECCIÓN DE MALFORMACIONES OCULARES CONGÉNITAS EN EL ISTMO DE TEHUANTEPEC, OAXACA, MEXICO

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Assessment of Community Participation and Sociodemographic Conditions in the Detection of Congenital eye Malformations in the Isthmus of Tehuantepec, Oaxaca, Mexico

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ABSTRACT

This study focused on the detection and analysis of congenital eye diseases in the communities of Salina Cruz and Juchitán de Zaragoza, located in the Isthmus of Tehuantepec region, Oaxaca, Mexico. The study population included twenty possible cases, of which only seven met the specific criteria established for the study, ensuring the validity of the results. The region is characterized by its predominantly Zapotec cultural diversity and a high percentage of indigenous language speakers, which meant that interpreters were needed for effective communication during interviews with the parents or guardians of the affected children. Sociodemographic questionnaires were administered to thirty-four participants, noting that most are engaged in domestic work and have varying levels of education, ranging from no schooling to postgraduate degrees. The collaboration of medical specialists in ophthalmology was essential for the diagnosis and appropriate selection of cases. The study highlights the importance of addressing cultural and linguistic barriers in public health research, as well as the ethical commitment to encourage community participation. These findings provide a solid basis for future interventions aimed at improving the detection, prevention, and management of congenital eye diseases in this multi-ethnic region of Oaxaca, Mexico.

***Keywords*:** congenital eye diseases, indigenous population, public health, cultural diversity, isthmus of tehuantepec

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Evaluación de la Participación Comunitaria y Condiciones Sociodemográficas en la Detección de Malformaciones Oculares Congénitas en el Istmo de Tehuantepec, Oaxaca, Mexico

RESUMEN

Este estudio se centró en la detección y análisis de enfermedades oculares congénitas en las comunidades de Salina Cruz y Juchitán de Zaragoza, ubicadas en la región del Istmo de Tehuantepec, Oaxaca, México. La población de análisis incluyó veinte posibles casos, de los cuales solo siete cumplieron con los criterios específicos establecidos para el estudio, garantizando la validez de los resultados. La región se caracteriza por su diversidad cultural predominante zapoteca y un alto porcentaje de hablantes de lenguas indígenas, lo que implicó la necesidad de intérpretes para una comunicación efectiva durante las entrevistas con padres o tutores de los menores afectados. Se aplicaron cuestionarios sociodemográficos a treinta y cuatro participantes, destacando que la mayoría se dedica a labores del hogar y presenta distintos niveles educativos, desde ausencia de estudios hasta posgrado. La colaboración de médicos especialistas en oftalmología fue fundamental para el diagnóstico y la selección adecuada de los casos. El estudio subraya la importancia de abordar las barreras culturales y lingüísticas en investigaciones de salud pública, así como el compromiso ético para fomentar la participación comunitaria. Estos hallazgos ofrecen una base sólida para futuras intervenciones dirigidas a mejorar la detección, prevención y manejo de enfermedades oculares congénitas en esta región multiétnica de Oaxaca, México.

Palabras clave: enfermedades oculares congénitas, población indígena, salud pública, diversidad cultural, istmo de tehuantepec

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INTRODUCTION

The assessment of community participation and sociodemographic conditions in the detection of congenital eye malformations is a topic of relevance for regional development and public health, specifically in regions or areas considered to be highly marginalized (Stapleton et al., 2023). The Isthmus of Tehuantepec, a region in southeastern Mexico with significant ethnic and socioeconomic diversity (Gómez-Martínez, 2010), provides a favorable setting for examining how these variables influence the early detection of eye disorders. The relationship between community, sociodemographic factors, and the detection of congenital eye malformations is fundamental to designing interventions that seek to improve early diagnosis and comprehensive care, to contribute to the quality of life and social development of the Oaxacan population in this region.

The Isthmus of Tehuantepec stands out as a strategic area in Mexico, characterized by a complex interaction between its cultural wealth, ethnic diversity, and economic particularities (Hofmann, 2024). Despite its significant potential in terms of connectivity and natural resources, the region faces substantial challenges, as does the entire state of Oaxaca, in terms of health equity, reflected in limited access to specialized services and educational and economic gaps (Padilla-Rivera et al., 2024). These structural and sociodemographic conditions directly influence the identification and management of congenital eye malformations, disorders that, when not detected promptly, can lead to permanent visual impairments or functional loss that negatively impact the individual's overall development and social integration (González-Villoria & Abeldaño-Zuñiga, 2018; Elam et al., 2022).

Congenital eye malformations comprise a diverse set of structural abnormalities of the eye and its adnexa, present at birth or manifesting in the neonatal period and early childhood (Guercio & Martyn, 2007). These malformations include conditions such as anophthalmia (complete absence of the eye), microphthalmia (small eye), coloboma (defect in the eye structure), optic nerve dysgenesis, and deformities of the cornea or lens, among others. From a clinical perspective, these pathologies are often associated with significant vision loss or blindness and usually require multidisciplinary interventions ranging from reconstructive surgery to visual rehabilitation treatments (Russo et al., 2025; Harding & Moosajee, 2019; Chen et al., 2021).

Early detection is crucial to maximizing functional potential and avoiding severe disabilities, which depend mainly on active community participation and the availability of adequate diagnostic resources. Congenital eye malformations have a complex multifactorial etiology, in which genetic and environmental factors interact. Eye formation is a highly regulated process during embryogenesis, involving multiple genes and signaling pathways (Bovolenta & Martinez-Morales, 2019). Genetic alterations, whether due to point mutations, deletions, or duplications, can disrupt the normal development of the eyeball and its associated structures. Adverse environmental exposures during pregnancy, such as maternal infections (toxoplasmosis, rubella), nutritional deficiencies, use of teratogenic medications, or maternal metabolic conditions, can increase the risk of malformations (Cifuentes et al., 2025). In the Isthmus of Tehuantepec, health education and access to prenatal care are limited, hindering the prevention and early detection of these risk factors, leading to a higher incidence and late diagnosis, which further complicates appropriate clinical management.

By promoting awareness of the importance of early diagnosis and working together to reduce stigma and cultural barriers, communities can strengthen their response capacity, facilitating timely referrals to specialized services (Coombs et al., 2022). These aspects are crucial in preventing irreversible visual impairment. For highly marginalized, low-income populations with limited medical infrastructure, the lack of information, combined with poor access to pediatric ophthalmology services, limits the opportunity for early diagnosis. In indigenous communities, language barriers, cultural differences, and mistrust of formal health systems further hinder the identification and management of these cases (Martínez-Martínez & Rodríguez-Brito, 2020). This study focuses on analyzing community participation and the sociodemographic conditions that affect the detection of congenital eye malformations in the Isthmus of Tehuantepec, to provide a comprehensive approach that facilitates the formulation of contextualized intervention strategies.

METHODS

The research was conducted in the Isthmus of Tehuantepec region in Oaxaca, Mexico, a multi-ethnic area characterized by its cultural diversity and predominance of indigenous language speakers, specifically Zapotec. This area was selected due to its geographical, climatic, and social characteristics, which influence the detection of congenital eye malformations, thereby determining community

participation factors and sociodemographic conditions. An observational, descriptive, and cross-sectional design was used, focused on evaluating community participation and sociodemographic conditions related to the detection of congenital eye malformations in two communities: Salina Cruz and Juchitán de Zaragoza. The sample consisted of individuals with clinically suspected congenital eye malformations detected during community eye care campaigns. To this end, medical specialists made an initial diagnosis and applied specific inclusion criteria. An open call was made to the local population to participate in the study.

Data collection techniques and instruments

The instruments used to collect information included semi-structured interviews designed and validated with a Cronbach's alpha of 0.88, to capture not only basic sociodemographic data, but also aspects related to the community's perceptions of congenital eye diseases, usual health practices, and barriers faced in accessing specialized medical services. These interviews were conducted in a flexible format, adapting to the context of the interlocutor to create an atmosphere of trust and openness.

The research team undertook a series of preliminary community outreach activities, including informational meetings with local leaders and awareness sessions on the importance of early detection of eye malformations. This initial engagement was crucial to increasing willingness to participate and ensuring that the study was conducted with respect for local norms and worldviews.

In technical terms, the ophthalmological examinations were carried out using portable equipment suitable for fieldwork, and standardized protocols for clinical diagnosis were applied to identify congenital eye malformations with a high degree of reliability in non-hospital conditions. Prior training of staff in intercultural care and communication skills facilitated patient-centered care that was sensitive to cultural differences.

Data analysis and ethical considerations

The quantitative data collected were organized using SPSS statistical software version 22 to facilitate a descriptive analysis that would identify sociodemographic patterns associated with community detection and participation. At the same time, a qualitative study of the open-ended responses was conducted to gain a deeper understanding of the sociocultural dynamics that influence the process of identifying and managing these pathologies.

To cover ethical aspects, written informed consent was obtained from all participants or their legal guardians. The study complied with current ethical standards for human research, ensuring confidentiality, voluntariness, and safety for the subjects based on Mexican Official Standard 012-SSA3-2012 (NOM-012-SSA3-2012).

RESULTS

Screening sessions were held in the communities of Salina Cruz and Juchitán de Zaragoza, Oaxaca, inviting residents to participate. In this initial phase of the study, two ophthalmologists, two assistants, and one researcher collaborated. Participants were recruited through an initial diagnosis provided by the medical specialists, who applied specific selection criteria to identify pathologies related to congenital eye diseases during interviews with participants. This approach ensured that the selected subjects met the necessary requirements for the study, thus guaranteeing the validity and relevance of the data collected.

A total of twenty possible cases of congenital eye diseases were treated in the communities of Salina Cruz and Heroica Ciudad de Juchitán de Zaragoza, Oaxaca, Mexico. During the recruitment process, various reasons were identified why eight of the subjects chose not to participate in the study, reflecting the importance of addressing the concerns and needs of the local population to encourage their involvement in scientific research.

In addition, five cases were excluded from the analysis because they did not meet the specific criteria established for the study. These criteria are essential to ensure the validity and relevance of the results, as they allow for the appropriate selection of participants with the congenital eye conditions of interest. The rigorous application of these criteria ensures that the data collected is representative and valid for a better understanding of the characteristics and prevalence of these conditions in the region. It is essential to emphasize that this process is not limited to case selection, but also involves a commitment to ethics and transparency in research.

During the fieldwork, face-to-face interviews were conducted, and questionnaires on sociodemographic data were administered to a total of 34 parents or guardians of the selected subjects. It is important to note that 77% of the participants were speakers of an indigenous language, which made it necessary to use interpreters to ensure effective and accurate communication during the data collection process.

This underscores the importance of considering language barriers in studies involving diverse communities, ensuring that all participants can express their opinions and experiences without difficulty.

The average age of respondents was 47.8 years; however, it is essential to mention that 85.7% of the study subjects are minors (n=6). Therefore, the approval of their parents or guardians was required for their participation in the study, which was formalized through the signing of an informed consent form. This procedure is essential to protect the rights and safety of minors involved in scientific research.

Regarding the educational level attained by respondents, it was observed that 8.9% had no formal education. In comparison, 26.7% had completed primary education, 20% had attended secondary school, 27.8% had attained high school graduation, 13.3% had a bachelor's degree, and only 3.3% had postgraduate studies. These data reflect a varied educational landscape that may influence the understanding and management of health in the community.

About current occupations, it was found that 6.7% are merchants, 21.1% are employees in various areas, and a notable 72.2% are engaged in household work. This occupational distribution highlights the importance of unpaid work and its impact on family and community dynamics.

Taken together, these findings provide valuable context for understanding the sociodemographic characteristics of the study population and their relationship to congenital eye diseases, which may guide future interventions and public health policies in the region.

DISCUSSION

Oaxaca is one of the 32 states that make up the Mexican Republic, renowned for its extraordinary cultural diversity, which is evident in the coexistence of numerous ethnic groups and the presence of approximately 1.22 million speakers of indigenous languages. Among these groups, the Zapotec stands out as the most predominant, reflecting a rich cultural and linguistic heritage.

The Isthmus of Tehuantepec region in the state of Oaxaca, Mexico, is the subject of analysis in this study. It is strategically important due to its location. This area is home to a predominantly Zapotec multi-ethnic population, where diverse ethnic groups contribute distinctive histories and languages that enrich the local culture. This region has been a focal point for natural disasters such as floods and earthquakes, as well as epidemics that have severely impacted its social and economic development.

Recently, the COVID-19 pandemic has exacerbated existing vulnerabilities in the population.

The social, political, and cultural dimensions that affect these communities in the Isthmus, as well as factors such as malnutrition, play a crucial role in the quality of life of their inhabitants. The combination of all these elements makes it even more complex, given the context in which this research is being conducted, highlighting the need to address local challenges from a comprehensive perspective that takes into account cultural particularities as well as socioeconomic conditions.

The sociodemographic results obtained reflect a picture that coincides with observations in other indigenous contexts. Studies in Amazonian indigenous communities in Venezuela and Colombia documented similar difficulties in detecting eye diseases due to language barriers and mistrust of formal health systems, which limit the early identification of visual pathologies (PAHO, 2018; Hernández-Sarmiento et al., 2017). This phenomenon is comparable to the high proportion of indigenous language speakers (77%) in our study, which required the inclusion of interpreters to ensure effective communication, highlighting the need for culturally sensitive approaches that consider linguistic particularities to achieve success in community eye care.

The prevalence of minors among subjects with congenital ocular malformations (85.7%) reflects the marked importance of timely diagnosis in pediatric groups, a fact that is recognized internationally. A study in communities in the Xingu Indigenous Park in Brazil highlighted the need for screening and visual education campaigns among indigenous children, emphasizing that early correction of visual defects can open up future educational and employment opportunities, improving the quality of community life (Fernandes et al., 2021). These parallels may indicate that interventions targeting indigenous populations should be prioritized in pediatric programs to maximize their impact.

The heterogeneous educational level found among parents and guardians has an incidental influence on the understanding and management of eye health conditions in the community. This coincides with international clinical reviews that link low education with lower participation in visual screening programs and adherence to treatments (Burnett et al., 2018). Educational diversity poses a challenge in designing education and awareness campaigns that cater to varying levels of literacy and knowledge about eye health, a critical factor in increasing detection and providing better follow-up.

CONCLUSIONS

In conclusion, we can say that the detection of congenital eye malformations is deeply influenced by sociocultural and demographic factors, which lead to a lack of determination in the viability of effective preventive or therapeutic interventions in marginalized regions of the state of Oaxaca. The predominance of indigenous language speakers, together with low educational levels and high rates of domestic work, reflects and perpetuates a context of structural inequality that directly affects access to and follow-up of specialized medical services. It is essential to consider promoting awareness campaigns and intercultural education to overcome linguistic and sociocultural barriers that can hinder risk perception and the timely identification of visual pathologies in minors. The high proportion of affected children and limited access to diagnostic resources highlight the urgent need to strengthen community training, engage local leaders, and adapt screening methodologies that take into account cultural diversity and differentiated literacy levels. Informed consent processes and the active involvement of parents or guardians, verified through a rigorous ethical strategy, can be key elements in strengthening trust and participation in epidemiological studies.

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