INDETERMINATE LIKERT SCALES FOR THE PERCEPTION OF RIGHTS VIOLATION IN PREGNANT ADOLESCENTS IN TULCÁN

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ABSTRACT
The current study explored the perception of rights violations among pregnant adolescents in the city of Tulcán, using a mixed-methodological approach that integrates quantitative and qualitative analysis through the use of indeterminate Likert scales and probabilities via Plithogenic Logic. Through cluster analysis, different groups within the sample were identified, based on their perceptions of knowledge about legal regulations and rights, experiences of vulnerability, and the care received in educational, health, and public institutions. The results revealed a high perception of rights violation, especially concerning medical care and educational support, though with significant variability influenced by various factors. The need for focused and differentiated public policies that address both the symptoms and the underlying causes of vulnerability is underscored, aiming toward the creation of a safer and more empowering environment for pregnant adolescents in Tulcán.

KEYWORDS: vulnerability; pregnant adolescents; perception; indeterminate Likert scale, Plithogenic Statistics

MSC: 62P25, 91D10, 68T37, 93A30, 03B70

RESUMEN
El presente estudio exploró la percepción de violaciones de derechos entre adolescentes embarazadas en la ciudad de Tulcán, utilizando un enfoque metodológico mixto que integra análisis cuantitativo y cualitativo a través del uso de escalas Likert indeterminadas y probabilidades mediante Lógica Plitogénica. A través de un análisis de conglomerados, se identificaron diferentes grupos dentro de la muestra, basados en sus percepciones sobre el conocimiento de las regulaciones legales y derechos, experiencias de vulnerabilidad y la atención recibida en instituciones educativas, de salud y públicas. Los resultados revelaron una alta percepción de violación de derechos, especialmente en lo que respecta a la atención médica y el apoyo educativo, aunque con una variabilidad significativa influenciada por diversos factores. Se subraya la necesidad de políticas públicas focalizadas y diferenciadas que aborden tanto los síntomas como las causas subyacentes de la vulnerabilidad, con el objetivo de crear un entorno más seguro y empoderador para las adolescentes embarazadas en Tulcán.

PALABRAS CLAVE: vulnerabilidad, adolescentes embarazadas, percepción, escala Likert indeterminada, Estadísticas Plitogénicas.

1. INTRODUCTION

Adolescence represents a critical phase of transition and growth, marked by profound changes that shape an individual's journey toward adulthood. Deriving its etymology from the Latin term adolecere, which signifies growth, advancement, and overcoming dependency, adolescence embodies a period of evolution and dynamic transformation. It is during this phase that the foundations for holistic development, spanning physical, emotional, cognitive, and social dimensions, are established. However, adolescent pregnancy can disrupt this natural trajectory, leading to adverse consequences such as diminished autonomy, interruption of educational pursuits, social disengagement, and delayed personal growth [1]. As a public health concern, adolescent pregnancy has far-reaching implications, precipitating conflicts within families, schools, and communities, while also significantly impacting the national economy and altering adolescents' life trajectories. The intersection of sociocultural, historical, religious, political, and economic factors has often hindered the development of comprehensive sexual education within familial, communal, and educational contexts [9]. Poor communication between adolescents, parents, educators, and society further exacerbates this issue, impeding the cultural shift required to address gaps in sexual education. Effective education must encompass not only biological aspects but also the socio-emotional, psychological, and cognitive dimensions, fostering informed decision-making and awareness of the rights and responsibilities associated with sexuality [7].

In Latin America and the Caribbean, approximately 140 million young people form a significant demographic, among whom unplanned adolescent pregnancies contribute to heightened vulnerability. The region reports the world's second-highest adolescent pregnancy rate, with nearly 18% of births attributed to mothers under 20 years

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of age. In Ecuador, over 41,000 girls and adolescents aged 10 to 19 become mothers annually [11]. Data from Ecuador's National Institute of Statistics and Censuses reveals that 15.7% of births are from adolescent mothers, with 0.7% involving girls under 14 years old. This positions Ecuador as the country with the second-highest incidence of adolescent pregnancies in the region. The situation remains critical, as evidenced by the Ministry of Health's data: by May 2022, 2,184 girls aged 10 to 14 had attended their first prenatal check-up, compared to 4,196 cases reported for the entire year of 2021. Additionally, in the first five months of 2022, 32,146 adolescents aged 15 to 19 sought prenatal care, compared to 61,090 throughout 2021. Seven provinces show the highest prevalence of adolescent pregnancy: three in the Amazon region (Morona Santiago, Pastaza, and Zamora Chinchipe) and four in the coastal region (Los Ríos, Manabí, Esmeraldas, and Guayas) [6].

In addressing adolescent reproductive health, a multidisciplinary and intersectional approach is essential. Such a framework must transcend unilateral interventions, encompassing individual, familial, community, and societal levels to safeguard reproductive health while upholding fundamental human rights [5]. However, the inherent indeterminacies in evaluating and managing reproductive health and rights in adolescents, particularly in Tulcán, introduce additional complexities. These uncertainties stem from variations in individual circumstances and broader socioeconomic, cultural, and political dynamics that influence adolescent health and well-being [2]. To navigate this complexity, the integration of plithogenic logic into the analysis of perceptions among pregnant adolescents in Tulcán offers a novel and promising approach. This framework enables a more nuanced understanding of the challenges faced by this vulnerable group [4]. Complementing this methodology, the use of indeterminate Likert scales facilitates the collection of granular data on adolescents' attitudes and perceptions. By allowing respondents to express varying degrees of agreement or disagreement with statements about their rights and well-being, this method highlights the effectiveness of current policies and identifies areas needing improvement [10].

In Tulcán, where sociocultural, economic, and legal factors intersect to create a challenging environment for pregnant adolescents, the application of these tools is particularly relevant. Analyzing perceptions through Likert scales not only reveals the extent of rights violations but also provides empirical evidence for refining policies and designing targeted interventions. Furthermore, this participatory approach empowers adolescents, acknowledging their agency and valuing their input in the development of inclusive and respectful solutions. This study, therefore, aims to evaluate the perception of rights violations experienced by pregnant adolescents in Tulcán. By employing an analytical framework grounded in plithogenic logic and enriched with indeterminate Likert scales, this research seeks to deepen the understanding of the health and rights of this population. The findings aspire to contribute to the formulation of effective interventions that ensure the protection and promotion of adolescent well-being in this context.

2. REFINED NEUTROSOPHIC SET AND PLITHOGENY

Introduced by Smarandache in 2005, Neutrosophic delves into the study of a concept, phenomenon, or entity "A" in terms of its opposition "Anti-A" and its non-existence "Non-A," as well as the state of being neither "A" nor "Anti-A," termed as "Neut-A". [8]

Consider X to represent a metric space, with each element within X indicated by x. Within this framework, a Single-Valued Neutrosophic Set (SVNS) A in space X is delineated by three membership functions: the truth function $T_{A(x)}$, the indeterminacy function $I_{A(x)}$, and the falsity function $F_{A(x)}$. For any given point x in X, the values of $T_{A(x)}$, $I_{A(x)}$, and $F_{A(x)}$ lie within the interval $[0, 1]$, satisfying the condition

$$0 \leq T_{A(x)} + I_{A(x)} + F_{A(x)} \leq 3.$$

Hence, the SVNS A is represented as $A = \{ x, T_{A(x)}, I_{A(x)}, F_{A(x)} | x \in X \}$, [9]. Building upon smarandache's refined neutrosophic logic, the following is obtained: [10]

Definition 1: The notion of truth T is subdivided into various subclasses $T_1, T_2, \dots, T_p$; similarly, indeterminacy I is categorized into $I_1, I_2, \dots, I_r$, and falsity F into $F_1, F_2, \dots, F_s$. Here, p, r, s where p, r, and s, are positive integers with the sum $p + r + s = n$.

The concept of Triple Refined Indeterminate Neutrosophic Sets (TRINS) further segments the idea of indeterminacy into three distinct membership categories, thus enhancing specificity and relevance for applications such as personality assessment using the Likert scale. In contrast, a Double-Valued Neutrosophic Set (DVNS) divides indeterminacy into two parts.

Definition 2: A TRINS A in X, as previously outlined, is identified by five membership functions, namely positive $P_{A(x)}$, indeterminate $I_{A(x)}$, negative $N_{A(x)}$, positively indeterminate $IP_{A(x)}$, and negatively indeterminate $IN_{A(x)}$, each accompanied by a respective weight $w_m \in [0, 5]$.

For every $x \in X$, we say: $P_A(x), IP_A(x), I_A(x), IN_A(x), N_A(x) \in [0, 1]$ with their weighted forms:

$$w_m P(P_A(x)), w_m IP(IP_A(x)), w_m I(I_A(x)), w_m IN(IN_A(x)), w_m N(N_A(x)) \in [0, 5],$$

adhering to the restriction

$$0 \leq P_A(x) + IP_A(x) + I_A(x) + IN_A(x) + N_A(x) \leq 5.$$

Thus, the TRINS *A* is denoted as

$$A = \{\ x, P_A(x), IP_A(x), I_A(x), IN_A(x), N_A(x) | x \in X\}$$

Concentrating on a pair of TRINS, identified as *A* and *B* within the confines of the metric space *X*, a third TRINS, *C*, is obtained through the intersection of *A* and *B*, which is mathematically denoted as $C = A \cap B$. The determination of *C*'s membership regarding truth, inclination towards truth, absolute indeterminacy, inclination towards falsity, and outright falsity, is accomplished through specific functional equations derived from the membership levels of *A* and *B:*

$$T_{C(x)} = \min\left(T_{A(x)}, T_{B(x)}\right)$$
$$IT_{C(x)} = \min\left(IT_{A(x)}, IT_{B(x)}\right)$$
$$I_{C(x)} = \min\left(I_{A(x)}, I_{B(x)}\right)$$
$$IF_{C(x)} = min\left(IF_{A(x)}, IF_{B(x)}\right)$$
$$F_{C(x)} = \max\left(F_{A(x)}, F_{B(x)}\right)$$

In the sphere of advanced Neutrosophic, there is a critical concept regarding the computation of an overarching weight, which aggregates the effects of all membership functions in the TRINS structure. This concept is crucial for the evaluation of the relevance and impact of each membership function on the neutrosophic set's aggregate value. The overall weighting for a TRINS A, represented as w_A, is mathematically articulated as:

$$w_A = \left(\sum_{i=1}^{n} w^T T_{A(x_i)} + w^I IT_{A(x_i)} + w\, I_{A(x_i)} + w^F IF_{A(x_i)} + w^N F_{A(x_i)}\right) \quad (1)$$

In this equation, $w^T, w^I, w, w^F, y\, w^N$ are the weights associated with the truth, inclination towards truth, indeterminacy, inclination towards falsity, and falsity membership functions, respectively. These weights play a critical role in assessing the significance of each membership function in the neutrosophic set and their overall contribution to the neutrosophic analysis's expansive theoretical framework.

F. Smarandache's Plithogeny concept delves into the origins, development, evolution, and refinement of novel entities through the dynamic integration of existing, potentially disparate elements, which may be antagonistic, neutral, or synergistic. This idea advocates for the fusion and integration of conceptual frameworks and insights across a wide range of disciplines, promoting an interdisciplinary confluence of knowledge from diverse fields such as the soft sciences, hard sciences, arts, and theoretical aspects of literature. [11]

Within this paradigm, a Plithogenic Set is defined as a significant set P, located within a specified domain $U(P \subseteq U)$ distinguished by one or more unique attributes $A_1, A_2, \ldots, A_m, m \geq 1$. Each attribute in this set has the potential to assume values across *S*, a vast spectrum of possible states. This spectrum is characterized by its variability, encompassing finite or infinite, discrete or continuous, and open or closed ranges. [12]

This framework emphasizes the flexibility and dynamic nature of plithogenic sets, reflecting the breadth and complexity of the knowledge and phenomena they aim to represent. By integrating a diverse array of attributes and their possible values into a cohesive set, the plithogenic methodology enables a deeper, more holistic investigation of entities. It encourages an interdisciplinary exchange and inquiry that breaks down traditional barriers between various academic disciplines.

In the context of each element $x \in P$, its characteristics span the complete array of possible attribute values within the set $V = \{v_1, v_2, \cdots, v_n\}$. The degree of membership $d(x, v)$ for an element *x* in set *P* is determined in relation to a particular criterion, and can be described as fuzzy, intuitionistic fuzzy, neutrosophic, among others.[13]

This signifies that for every element *x* in the set *P*, there exists a function $d: P \times V \rightarrow \wp([0,1]^z)$, where $\wp([0,1]^z)$ denotes the power set of $[0,1]^z$. The variable, *z* signifies the level of belonging, with $z = 1$ denoting a fuzzy membership level, $z = 2$ indicating an intuitionistic fuzzy membership level, and, and $z = 3$ representing a neutrosophic membership level.

In this advanced exposition of plithogenic sets, a nuanced mechanism is introduced for evaluating the degree of contradiction between different attribute values within such sets. If we denote *V* as the value set with its cardinality being greater than or equal to 1, we define a specialized function $c: V \times V \rightarrow [0,1]^2$. This function, known as the attribute value contradiction degree function, is designed to quantify the level of contradiction between any pair of attribute values v_a, v_b. The functionality of this measure is governed by a set of fundamental principles: [14,17]

$c(v_a, v_a) = 0$, which asserts that there is no contradiction in an attribute value when compared with itself, encapsulating the principle of non-contradiction.

$c(v_a, v_b) = c(v_b, v_a)$, which underscores the symmetry in the degree of contradiction between any two distinct attribute values, suggesting that the contradiction is mutual and unaffected by the order of comparison.

The notation *c* is specifically chosen to highlight that this function operates within the realm of fuzzy logic, implying a continuum of contradiction degrees rather than binary or discrete states. Additionally, variations of this function, such as $c_{IF}: V \times V \rightarrow [0,1]^2$, are conceptualized to accommodate the framework of neutrosophic logic, thereby acknowledging and quantifying varying levels of certainty or contradiction inherent in the attribute values.

Within the framework of a Plithogenic Set, described as (*P*, *a*, *V*, *d*, *c*), the element of the primary set *P*, an attribute set *A*, a set of values *V*, a membership function *m*, and a contradiction degree function *d*, conceptually

corresponding to *c*. The function of contradiction is very important for the assessment and quantification of contradiction levels among attributes, especially when considering a primary attribute as critically more significant than others. This framework thus equips a sophisticated mechanism for dissecting and comprehending the intricate relationships of attributes within a Plithogenic Set, providing deep insights into the contradiction and congruence dynamics among set elements. [15,18]

On another note, (*U*, *a*, *V*, *d*, *c*) is identified as Plithogenic Probability, where *E* signifies the event space. Plithogenic Probability is articulated as the probability of an event happening, influenced by all associated random variables, which might follow classical, *T*, *I*, *F*-neutrosophic, *I*-neutrosophic, *T*, *F*-intuitionistic fuzzy, *T*, *N*, *F*-picture fuzzy, *T*, *N*, *F*-spherical fuzzy, or other fuzzy extensions distribution functions. Hence, Plithogenic Probability broadens the traditional scope of multivariate probability. [16]

Additionally, Plithogenic Statistics expands upon traditional multivariate statistics by embracing the principles of Plithogenic Probability. This approach is distinguished by its capability to dissect and scrutinize probabilities into intricate components of truth, ambiguity, and falsity. Specifically, it segments probabilities into detailed fractions such as $1, 2, \dots, T_1, T_2, \dots . T_p$, for truths; $1, 2, \dots, I_1, I_2, \dots . I_q$ for indeterminacies; and $1, 2, \dots, F_1, F_2, \dots . F_r$, for falsities. This detailed segmentation ensures that within truths, indeterminacies, or falsities, at least one category contains more than a singular element, showing the complex nature of probabilities within a plithogenic context.

This nuanced subdivision enables Plithogenic Statistics to more accurately reflect the complexity of phenomena in the real world compared to classical approaches. By recognizing and quantifying varying degrees of truth, the potential for indeterminacy, and the possibilities of falsity in any scenario, Plithogenic Statistics offers a layered, multidimensional perspective on statistical analysis. This methodological enhancement allows for a deeper and more nuanced interpretation of statistical data, accounting for the inherent uncertainties and complexities present, thereby offering a more sophisticated and detailed understanding of statistical findings. [6,19]

3. METHODOLOGY

This study is framed within a mixed research design, which incorporates both quantitative and qualitative methodologies to assess the perception of rights violations among pregnant adolescents in the city of Tulcán. This approach allows for a comprehensive analysis of the participants' subjective and objective perceptions, facilitating the identification of patterns and the interpretation of indeterminacies in the collected responses.

The study population consists of 95 pregnant adolescent females at the time of the study. The initial selection of the sample covered the entirety of the target population. However, due to the incidence of exogenous factors that hindered the application and proper validation of the collected questionnaires, only a set of 76 pregnant adolescents residing in the city of Tulcán was considered, an effective sample for the analysis of the study. The participants present various stages of gestation, allowing for a differentiated analysis of perceptions throughout this vital period.

The applied questionnaire is structured based on indeterminate Likert scales, designed to measure the adolescents' perceptions regarding the violation of their rights derived from their gestational state. The questions cover a wide spectrum of potential violation situations, from access to health services to the treatment received in the educational and family environment.

The responses were analyzed using a mixed approach that combines traditional statistical analysis with plithogenic logic, specifically through the use of Neutrosophic Probabilities (NP). For each respondent, a TRINS matrix was constructed, categorizing each Likert scale response from negative membership (1) to positive membership (5). This allowed the degree of acceptance of the statements by the respondents to be determined, expressing the responses in the form of TRINS, denoted as G_x.

Each evaluation was represented by a vector in $[0,1]^5$, where each component of the vector reflects a category of evaluation from "Very High" to "Very Low". The formula $\gamma = 2v_1 + v_2 + 0.5v_3 - v_4 - 2v_5$ was used to analyze these data, calculating their relative frequency in percentages. Subsequently, frequency values were transformed into neutrosophic plithogenic probabilities to express the overall behavior of the dimensions studied. This was done using the equation $PN = p_1 + p_2, pI, np_2 + np_1$, representing the probabilities of each variable and their dimensions with values of the type *(T, I, F)*, where *T* indicates the "highly certain" probability that the variable or dimension analyzed is adequately fulfilled, *I* represents the "indeterminate" probability, and *F* the "highly certain" probability that the variable or dimension analyzed does not occur as expected.

This study is classified as exploratory-descriptive, as it seeks to explore and describe perceptions of rights violations in a specific context, using an innovative design that integrates quantitative and qualitative elements, and that allows the interpretation of complexities through plithogenic logic and the theory of neutrosophic probabilities.

4. RESULTS

The data collected through the surveys have undergone rigorous preliminary processing, laying the foundation for subsequent detailed analysis. Initially, a cluster analysis, a multivariate analysis technique, has been implemented

to discern intrinsic patterns in the data set. This statistical method allows for the classification of observations into homogeneous groups based on the similarities of their characteristics, which is crucial for understanding the underlying trends and structure of the data. Figure 1 displays the results obtained from this analytical procedure for the first section of the survey, providing a visual representation of the clustering and behavior of the respondents' answers.

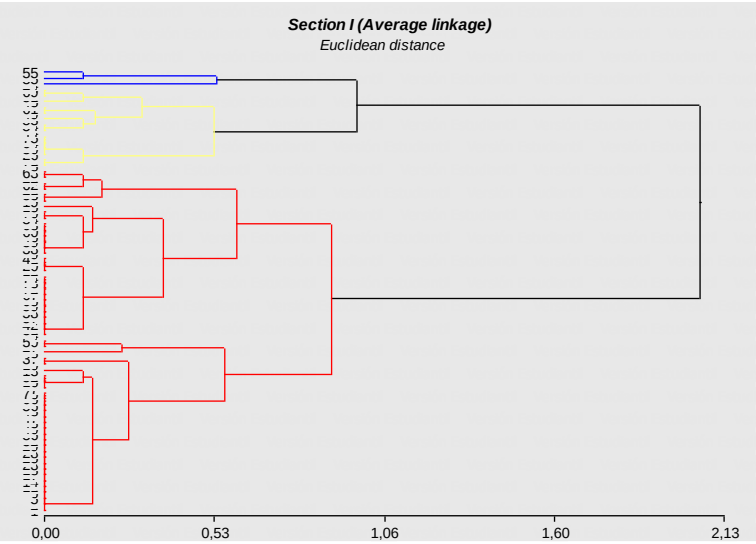

Figure 1. Cluster Analysis for the data obtained and included in the first section of the questionnaire: Knowledge of Legal Regulations and Rights of pregnant adolescents in Tulcán.

In this case, a relatively small group of respondents encompasses pregnant women with a medium level of knowledge, averaging an index of 1.08, which denotes a leaning towards a slightly positive perception or at least not fully defined in terms of their understanding of rights. In contrast, there is a much smaller group that encapsulates participants with the most limited knowledge, with an average index of -0.23, suggesting a significant lack of understanding or a possible disconnection regarding relevant regulations and rights. Finally, in a much larger group, those with the most robust knowledge are represented, with an average index of 1.83, suggesting a high degree of agreement or conformity with knowledge about their rights.

From the results, pertinent conclusions emerge: a pronounced division in the understanding of rights and legal regulations is observed. A non-negligible segment of the sample exhibits a positive understanding; however, there is a minority with a level of knowledge perceived as negative or uncertain.

The analysis carried out for the other two sections of the questionnaire reveals similar results. On the one hand, regarding Section II of the survey, which examines the perception of rights violations in pregnant adolescents, a very large first group with a high centroid is observed. This reveals a generally high index among its members, indicating a consensus or conformity regarding the perception of violation of their rights. This group seems to reflect a generalized agreement or an acceptance of the presence of violation in their daily experiences. Additionally, a smaller group with a much lower centroid is observed, grouping a segment of the sample whose general index denotes disagreement or a marked dissatisfaction. This suggests that the experiences or perceptions of this group contrast with the notion of violation, possibly indicating less adverse experiences or a different perspective on the reality of their treatment received.

The smallest cluster encompasses participants with a moderate perception of rights violation, which indicates a zone of uncertainty or more equidistant stances between agreement and disagreement with the statements proposed in the survey. This pattern highlights that a substantial proportion of the surveyed population in Tulcán shares a vision of significant violation of their rights.

The cluster analysis carried out in Section III, aimed at evaluating the attention in educational, health, and public institutions, also unraveled three main groups with approximate centers of 1.75, -1.2, and 0.73. The largest group, with a center close to -1.2, shows indices indicating negative perceptions or dissatisfaction with the level of attention received, which could be interpreted as a disapproval of the services provided by the mentioned institutions. The smallest cluster, with a center of 1.75, reflects a pronounced perception of satisfaction, indicating an experience of efficient attention that could translate into high conformity with the services received. Finally, the existence of a third group encapsulates those with ambiguous perceptions, possibly indicating variability in the quality of attention or a heterogeneous experience in these institutions. This group illustrates the need for a nuanced analysis to understand varied experiences and properly direct efforts for improvement in public policies and institutional management. [20,21]

On the other hand, when analyzing in general the perceptions of the respondents regarding the evaluated elements, Figure 2 shows interesting results. The examined data reveal a tendency towards a constructive perception in relation to the knowledge of legal regulations and rights in Section I of the survey, implying a satisfactory level of awareness and understanding among participants. However, this positive perception experiences a decline when addressing the experience of rights violation in Section II and decreases even further when evaluating the attention received in institutional entities in Section III, which could reflect a less favorable evaluation of the experiences and services received.

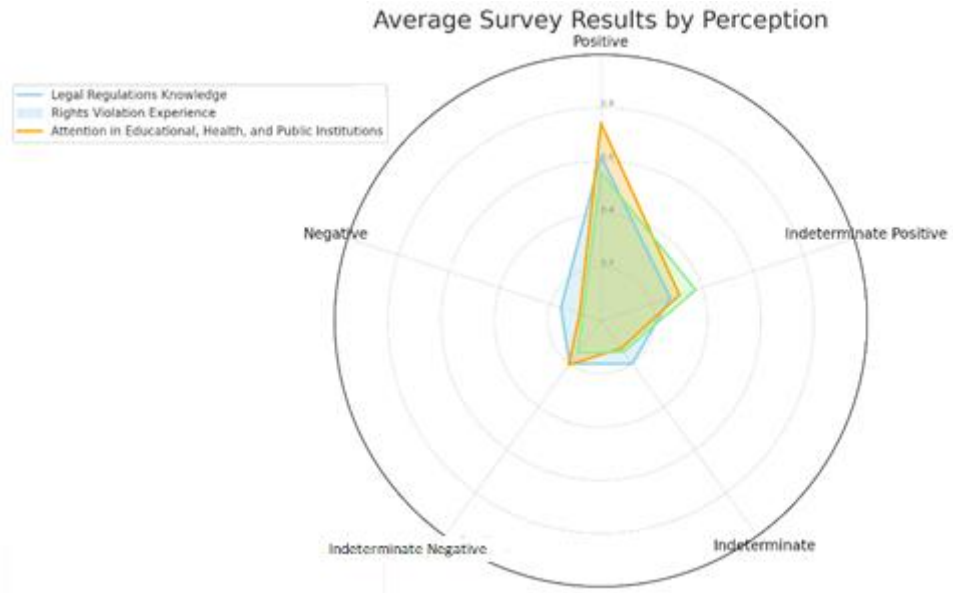

Figure 2: General average results of perceptions based on TRINS according to the surveys applied

The perception of indeterminacy with positive inclinations occurs to a lesser extent compared to the positive perception in all sections, although it maintains a similar decreasing sequence, being more pronounced in Section I. This pattern suggests that, although there is uncertainty with a tendency to agree, this is outweighed by more defined convictions. As for the perception of indeterminacy, it shows a low presence in Section I and slightly rises in Section II, subsequently decreasing in Section III. This dynamic could be interpreted as a comparatively greater clarity in understanding rights versus experiences of violation and interactions with institutions.

On the other hand, negative indeterminate perceptions and negative perceptions, although minor about the positive and positive indeterminate ones, are significant, especially in Section II where there is a greater propensity towards negative valuations. The existence of these perceptions highlights the presence of a segment of the population that experiences and perceives adversities in all the evaluated areas.

The synthesis of these results illustrates a predominance of favorable attitudes and knowledge in the areas of interest. However, it is identified that negative experiences and the perception of rights violations constitute areas of latent concern, which substantially impact the general perception and demand focused attention. These findings offer valuable insight that emphasizes the need to strengthen protection and support mechanisms for pregnant adolescents, especially regarding the optimization of institutional services and the expansion of education on rights and legal regulations.

Furthermore, the analysis of plithogenic probabilities was carried out following the proposed logic. From this, it was possible to create a table of refined and plithogenic probabilities that allows a more focused analysis of the obtained data.

Sections	RP	PP
Knowledge about Legal Regulations and Rights	(6.6; 63.2; 28.9; 1.3; 0)	(69.8; 28.9; 1.3)
Experience of Rights Violation	(22.4; 63.2; 11.8; 2.6; 0)	(85.6; 11.8; 2.6)

Violation in School, Health, and Public Institutions	(9.21; 60.53; 27.63; 2.63; 0)	(69.74; 27.63; 2.63)

Table 1: Table of refined and plithogenic probabilities

The presented analysis allows us to infer with a significant degree of certainty, specifically with a probability of 69.8%, that there is substantial knowledge about legal regulations and rights among the study subjects. This observation points to a relatively high level of familiarity with legal frameworks and relevant rights, although it is important to note the presence of a margin of uncertainty and a minimal percentage (1.3%) that suggests the possibility of inadequate knowledge in this domain among the examined sample.

Additionally, a marked probability is highlighted that respondents experience perceptions of rights violations related to their pregnancy status. This finding is particularly relevant, as instances of indeterminacy or ambiguity in the responses are significantly lower compared to other sections of the questionnaire. This indicates a tendency of the participants to adopt more defined positions, and ambiguous perceptions of their experiences are secondary. In this context, the probability of not recording a high perception of violation in the analyzed sample is limited to 2.6%.

Lastly, a high probability of perceiving rights violations within institutional settings, such as educational institutions, health, and public institutions, is identified. This observation suggests that negative perceptions are not limited to a specific area but extend to various facets of the interaction of pregnant adolescents with institutional structures. This phenomenon underscores the pressing need to address the dynamics contributing to these perceptions of violation, and to implement effective strategies that improve the interaction of pregnant adolescents with such institutions and, therefore, their overall experience concerning exercising their rights and accessing adequate services.

The findings highlight the need to develop and apply public policies that are both focused and differentiated, to mitigate the perceived vulnerability of pregnant adolescents in Tulcán. The results demonstrate a widespread perception of rights violations in this group. In response to this need, it is imperative that designed public policies comprehensively address the identified challenges, transcending temporary solutions to eradicate the very roots of vulnerability. This involves not only ensuring access to quality health and education services but also promoting an inclusive and respectful environment that empowers pregnant adolescents, recognizing and protecting their rights.

Given the evidence obtained from the study on the perception of vulnerability among pregnant adolescents, a set of strategies designed to address both manifestations and underlying causes of such vulnerability is proposed. These policies must respond to specific and differentiated needs, being able to adapt to the diversity of conditions and experiences within this population group. The proposed strategies are as follows:

1. **Creation of specialized educational programs:** Implement educational programs that address not only reproductive health and the legal rights of pregnant adolescents but also promote inclusion and respect within the educational system. These programs should be sensitive to the cultural and socioeconomic context of the young women, ensuring their accessibility and relevance.
2. **Strengthening access to comprehensive health services:** Expand and improve access to specialized health services for pregnant adolescents, including prenatal care, psychological support, and nutritional guidance. These services must be provided respectfully and without stigmatization, ensuring confidentiality and informed consent.
3. **Development of social protection policies:** Establish social protection mechanisms that address the socioeconomic causes of vulnerability, such as financial support programs, educational scholarships, and vocational training for pregnant adolescents and young mothers. These programs should aim to promote economic autonomy and facilitate a return to education or integration into the labor market.
4. **Encouragement of community participation and empowerment:** Actively involve pregnant adolescents in the design and implementation of policies and programs that directly affect them. The creation of safe spaces for dialogue, experience sharing, and collective empowerment is essential to ensure that public policies are truly inclusive and effective.
5. **Implementation of awareness campaigns:** Conduct awareness campaigns aimed at the general population, as well as health professionals, educators, and policymakers, to combat stigma and prejudices associated with teenage pregnancy. These campaigns should promote a culture of respect, equality, and support for the rights of pregnant adolescents.

The adoption of these actions requires a multi-sectorial commitment and collaboration among the government, non-governmental organizations, the private sector, and civil society. Only through an integrated and evidence-based approach will it be possible to effectively mitigate the vulnerability of pregnant adolescents in Tulcán and promote their well-being and that of their future children.

5. CONCLUSION

The results obtained in this study allow us to conclude with a high degree of certainty, specifically with a probability of 69.8%, that pregnant adolescents participating have considerable knowledge about legal regulations and their rights. Although this level of familiarity is remarkable, there is a margin of uncertainty and a small percentage (1.3%) that demonstrates a lack of knowledge in this area among certain participants. In addition, a marked perception of violations of adolescents related to their state of pregnancy was identified, which underlines the relevance of this problem. The answers reflected low levels of ambiguity, which suggests that most participants adopted defined positions on their situation. This finding is crucial since it shows the prevalence of negative perceptions about respect for their rights, especially within institutional environments such as educational, health and public. In practical terms, the findings of this study are of considerable importance. Vulnerability and rights violations perceptions in this population group highlight the need to implement focused public policies and adapted to the specific conditions of pregnant adolescents in Tulcán. These policies must transcend temporary solutions, addressing the structural causes of vulnerability. Among the priorities identified are to guarantee access to quality health and education services, promote an inclusive and respectful environment, and empower adolescents, recognizing and protecting their fundamental rights. This study contributes to the research field by integrating an innovative approach based on plitogenic logic and indeterminate Likert scales. This methodological framework allowed to accurately capture the nuances in the perceptions of adolescents about their situation and the services received, contributing both to the theoretical analysis and the formulation of practical strategies. Likewise, the incorporation of the perceptions of adolescents themselves reinforces the importance of their active participation in the design of more inclusive and effective policies. However, the study presents certain limitations that must be considered. The local nature of the analysis, focused on Tulcán, restricts the generalization of the results to other contexts without additional adaptations. In addition, although a robust framework was used to reduce subjectivity in responses, dependence on individual perceptions can influence general conclusions. Finally, it would be necessary to expand the sample and carry out longitudinal studies to capture broader temporal and contextual dynamics. Looking ahead, it is recommended to deepen the evaluation of complementary strategies that address the needs of this population. Alternative methods, such as Fuzzy analysis or models based on artificial intelligence, could be integrated to validate and expand the findings. In addition, comparative studies in other geographical regions would allow contrasting and enriching the conclusions obtained. It is essential to investigate in greater detail the cultural and socioeconomic factors that influence the perception of rights and accessibility to essential services. In summary, this study highlights the urgency of designing comprehensive and evidence-based public policies that mitigate the vulnerability of pregnant adolescents. The implementation of strategies such as specialized educational programs, expanded access to health services, social protection mechanisms, community awareness and empowerment campaigns are essential to guarantee the respect and full exercise of the rights of this group. Only through a multisectoral commitment and a comprehensive approach, it will be possible to generate a significant change in the lives of these adolescents and in the well-being of their future children.

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