Neutrosophic Statistics is an extension of Interval Statistics, while Plithogenic Statistics is the most general form of statistics (second version)

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Factors conducive to Pregnancy during Adolescence in Ecuador through Neutrosophic Statistics

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Abstract

Teenage pregnancy in Ecuador is a problem that continues to increase year after year. This, in addition to violating the rights of all girls and adolescents, perpetuates violence and inequality. Knowing the causes and consequences of teenage pregnancy allows planning action plans to combat them. The analysis of preliminary studies and surveys confirms levels of indeterminacy in the responses obtained for the study. This integration between neutrosophic sets makes it possible to reflect, through the representation of neutrosophic statistics, the level of deterioration of the factors that intervene in the full development from adolescence to adulthood. Consequently, the existing indeterminacy makes it necessary to model each element of the group studied to analyze the levels of deterioration associated with preventing teenage pregnancy in Ecuador.

Keywords: Pregnancy; adolescence; Neutrosophy; Neutrosophic Statistics.

1. Introduction

Adolescence is the period in a person's life between the ages of 10 and 19. In some cases, adolescence is interrupted when the young woman becomes pregnant. One in five women in the world already has a child before the age of 18 and every year there are 16 million births to teenage mothers. In the planet's poorest regions, one of every three women becomes a mother during adolescence [1].

Teenage pregnancy greatly limits a woman's opportunities to develop autonomously, both due to emotional and physiological immaturity, which in turn implies changes in affective, social, and economic circumstances that trigger important situational crises resulting from early pregnancy. For this reason, pregnancy in the adolescent stage has been described as a phenomenon framed within the problem with the highest social and family impact, with many consequences for sexual health, reproductive, economic, and family environment for the mother and the child. Pregnant adolescents have certain common sociodemographic characteristics in pregnancy. Among the causes with the highest incidence are the early age of onset of sexual relations, the low educational level, the origin of disintegrated families, and, above all, the low knowledge of contraceptive methods for the

prevention of pregnancy. It is therefore considered a difficult event that affects the comprehensive health of adolescent mothers, their children, family members, and the community as a whole [2].

According to experts, the most appropriate age to be a mother is between 20 and 35 years, since the risk to the health of the mother and child is much lower. Pregnancy in adolescence is considered high risk and carries more complications. The adolescent is not physically or mentally prepared to have a baby and take on the responsibility of motherhood.

Teenagers who become pregnant present in many cases:

- Tables of poor nutrition, with a lack of essential nutrients for the proper development of the baby

- An increased number of miscarriages

- Premature births, with a large number of babies being born before 37 weeks of gestation

- Their babies are underweight as their immature body means that their uterus has not fully developed

- Teen moms have children with more health problems and developmental disorders

- In cases of pregnancies of girls under 15 years of age, the baby is more likely to be born with malformations.

Other risks [3]

- Lack of medical attention due to ignorance of the pregnancy

- Risk of pre-eclampsia and eclampsia

- Risk of obstetric fistula, an invisible injury with devastating effects on the lives of thousands of women

- High maternal mortality

- Complications due to clandestine abortions, such as sepsis or severe bleeding

- Pregnancy linked to sexually transmitted diseases

- Psychological complications for the pregnant adolescent

In general, the studies speak of a series of circumstances that teenage mothers go through:

- Fear of being socially rejected: One of the consequences of adolescence and pregnancy is that the young woman feels criticized by her family and friends, and tends to isolate herself from the group.

- Rejection of the baby: They are girls and do not want to take on the responsibility, time, and obligations of being a mother. However, this also makes them feel guilty and sad and their self-esteem is lowered.

- Family problems: Communicating the pregnancy in the family is often a source of conflict and even rejection by their environment.

Factors that give rise to pregnancy in adolescence [4].

- Sexual relations without the use of contraceptive methods, or erroneous or mistaken use of them

- Teenage marriage and the traditional role that some societies still assign to women [5]

- Dangers due todrug consumption and alcoholic beverages and their consequences: disinhibition, lack of reflexivity, impulsiveness, etc.

- Social pressure and idealization of pregnancy in adolescence as ways to achieve acceptance in their close circles (friends and classmates, mainly).

- Lack of information and difficult access to good sexual education, as well as neglect or refusal of parents to talk about these issues openly and naturally.

In addition, on a psychological and social level it is common to find:

- Abandonment of studies will depend on the context and socio-economic level, among other factors.

- The trauma of an induced or spontaneous abortion, as well as the risks of falling into the black market in countries where this practice is not legalized.

- In developed countries, the new family will often be unstable (adolescent parents or short-term relationships), while in developing countries, it will represent a greater number of children.

- Psychological problems: fear of being rejected, anxiety, stress and family problems, rejection of the baby, or the appearance of serious emotional disorders.

- Maintaining unstable relationships (dysfunctional families) or harmful to women due to economic and emotional needs.

That is why the present investigation is intended to identify different factors that influence the increase in the number of pregnant adolescents. Pregnancy in the adolescent stage has a negative impact on its psychological, family, social and personal context. Therefore, there is a need to carry out an analysis toprevent teenage pregnancy in Ecuador. To analyze teen pregnancy, this study defines:

- Problem situation: increase in teenage pregnancy in Ecuador

- Main objective: to analyze the levels of deterioration of the elements associated with preventing pregnancy in adolescence in Ecuador

- Specific objectives:

    o Determine the factors that affect the analyzed variable

    o Carry out the measurement and modeling of the variable

    o Project potential alternatives in terms of preventing pregnancy in adolescence

2. Definition

Neutrosophic Statistics

Neutrosophic probabilities and statistics generalize classical and imprecise probabilities and statistics[6, 7]. For example, the Neutrosophic Probability of an event E is the probability that the event E occurs [8], the probability that event E does not occur, and the probability of indeterminacy (not knowing whether event E occurs or not). In classical probability nsup≤1, while in neutrosophic probability nsup≤3+. Neutrosophic Statistics have been used in many fields, [9-16]. The function that models the neutrosophic probability of a random variable x is called the neutrosophic distribution:

$$NP(x) \ = \ (T(x), I(x), F(x)),$$

Where T(x) represents the probability that value x occurs, F(x) represents the probability that value x does not occur, and I(x) represents the undetermined or unknown probability of value x.

Neutrosophic Statistics is the analysis of neutrosophic events and deals with neutrosophic numbers, neutrosophic probability distribution, neutrosophic estimation, neutrosophic regression, etc. It refers to a set of data formed totally or partially by data with some degree of indeterminacy and to the methods to analyze them.

Neutrosophic statistical methods allow neutrosophic data (data that may be ambiguous, vague, imprecise, incomplete, or even unknown) to be interpreted and organized to reveal underlying patterns [17, 18].

Finally, the Neutrosophic Logic [19], Neutrosophic Sets, and the Neutrosophic Probabilities and Statistics have a wide application in various research fields and constitute a novel study reference in full development.

Neutrosophic Descriptive Statistics comprises all the techniques for summarizing and describing the characteristics of neutrosophic numerical data[20-22].

Neutrosophic Numbers are numbers of the form where a and b are real or complex numbers, while "I" is the indeterminacy part of the neutrosophic number N.

$$N = a + bI.$$

The study of neutrosophic statistics refers to a neutrosophic random variable where X_l and $X_u I_N$ represents the lower and correspondingly higher level that the studied variable can reach, in an indeterminate interval $[I_l, I_u]$. The neutrosophic mean of the variable (x_N) is defined as:

$$X_N = X_l + X_u I_N; \ I_N \in [I_l, I_u] \tag{1}$$

Where, $\underline{x}_a = \frac{1}{n_N}\sum_{i=1}^{n_N} X_{il}, \qquad \underline{x}_b = \frac{1}{n_N}\sum_{i=1}^{n_N} X_{iu}, \qquad n_N \in$ $[n_l, n_u]$ $\tag{2}$

is a neutrosophic random sample. However, for the calculation of neutral squares (NNS), it can be calculated as follows

$$\sum_{i=1}^{n} N(X_i - \underline{X}_{iN})^2 = \sum_{i=1}^{n} N\big[\big((a_i + b_iI_L)(\underline{a} + \underline{b}I_L), (a_i + b_iI_L)(\underline{a} + \underline{b}I_U)\big) (a_i + b_iI_U)(\underline{a} + \underline{b}I_L), (a_i + b_iI_U)(\underline{a} + \underline{b}I_U)\big) \big((a_i + b_iI_L)(\underline{a} + \underline{b}I_L), (a_i + b_iI_L)(\underline{a} + \underline{b}I_U)\big) (a_i + b_iI_U)(\underline{a} + \underline{b}I_L), (a_i + b_iI_U)(\underline{a} + \underline{b}I_U)\big) \big], I \in [I_L, I_U] \tag{3}$$

Where $a_i = X_l b_i = X_u$. The variance of the neutrosophic sample can be calculated by:

$$S_N^2 = \frac{\sum_{i=1}^{n_N}(X_i - \underline{X}_{iN})^2}{n_N}; \ S_N^2 \in [S_L^2, S_U^2] \tag{4}$$

The neutrosophic coefficient (NCV) measures the consistency of the variable. The lower the value of the NCV, the more consistent the performance of the factor is than that of the other factors. The NCV can be calculated as follows [23].

$$CV_N = \frac{\sqrt{S_N^2}}{\underline{X}_N} \times 100; \ CV_N \in [CV_L, CV_U] \tag{5}$$

The Neutrosophic Argumentation coefficient evaluates the criteria through Linguistic Terms with SVNN of consensus of justification of the expert opinion, (see table 1) [24-26].

Table 1: Linguistic terms that represent the weight of the factors

Linguistic term	SVNN
No Impairment (NI)	(1,0.05,0)
Almost No Impairment (ANI)	(0.95,0.12,0.15)
Very Low Impairment (VLI)	(0.85,0.15,0.25)
Low Impairment (LI)	(0.75,0.3,0.4)
Slight Impairment (SI)	(0.65,0.35,0.5)
Impaired (I)	(0.55,0.45,0.53)
Slightly Impaired (MD)	(0.49,0.5,0.55)
Severely Impaired (SD)	(0.3,0.75,0.8)
Very Impaired (MD)	(0.25,0.8,0.85)
High Impairment (AD)	(0.15,0.9,0.95)
Extremely Impaired (ED)	(0.0.95.1)

3. Results

Data collection:

Statistics allows the analysis of situations in which the random components contribute significantly to the variability of the data obtained. To measure the levels of associated risks in pregnant adolescents, indeterminate random components are presented. The impossibility of measuring some determinants of health status in pregnant women is defined in the variability of responses of the respondents, similar to each other, who participated in the study.

Development of the method:

For the neutrosophic statistical modeling, the experts select five factors that prevail in the neutrosophic sets (elements associated with preventing pregnancy in adolescence), based on defining the variable to be studied (table 2).

Table 2: Characteristics of the variable

Variable	Coding	Sample factor	Scale
Levels of deterioration of the elements associated with preventing pregnancy in adolescence in Ecuador	DPEA	[45;203]	$[0 ; 1], \forall F_n$ RCD = 0 (false) RCD = 1 (True) $DCR \neq 0.5$ (Existing uncertainty in DPEA)

It should be borne in mind that the recommendations are subject to constant updating motivated by advances in sociodemographic research and the contributions of statistical information on pregnancy in adolescence and its risk conditions.

Table 3: Factors that influence the origin of teenage pregnancy

Factor	Source elements	Degree	Relation between factor and set	Scale	Element decision acceptance range
F1	Socio-economic status	L	Neutrosophic set: (malnutrition; level of poverty)	[0 ; 1]	Subsets: Malnutrition index (high, medium, low, or none) Poverty level (high, medium, low, or none)
F2	Adolescent reaction to pregnancy	R	Neutrosophic set: (emotional state, level of acceptance)	[0 ; 1]	Subsets: Emotional state (happiness, fear, sadness, surprise) Acceptance level (low, medium, high)
F3	Level of sexual education and continuity of studies	N	Neutrosophic set: (academic level, student improvement)	[0 ; 1]	Subsets: Sex education level (low, medium, high) Continuing studies (yes, maybe, no)
F4	Influence on the family and social environment	I	Neutrosophic set: (family; society)	[0 ; 1]	Subsets: Family; society (strong, medium, or low)
F5	Preparation and responsibility of the adolescent when caring for the son or daughter	P	Neutrosophic set: (Preparation; responsibility)	[0 ; 1]	Subsets: Preparation and responsibility (high, medium, low, or none)

For the development of the neutrosophic statistical study, it is recommended by the experts to analyze the levels of deterioration of the elements associated with preventing pregnancy in adolescence in Ecuador. Studies in risk conditions are associated, based on the statistical bases and the surveys carried out (table 3). To obtain the frequency of the interval for DPEA, a score referring to Table 1 (linguistic terms for each factor) is applied to each survey. The respondent (specialists in health, education and psychologists) determines from the analyzed sample (80 pregnant adolescents) which factors are affected and under what level of deterioration.

Table 4: Neutrosophic frequency of DCR.

No.	F1	F2	F3	F4	F5
1	[(0.3,0.75,0.8); (0.65,0.35,0.5)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]	[(0.25,0.8,0.85); (0.75,0.3,0.4)]	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0.15,0.9,0.95); (0.49,0.5,0.55)]
2	[(0.15,0.9,0.95); (0.65,0.35,0.5)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]
3	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0.25,0.8,0.85); (0.75,0.3,0.4)]	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.49,0.5,0.55)]
4	[(0.49,0.5,0.55); (0.95,0.12,0.15)]	[(0,0.95,1); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]
5	[(0.15,0.9,0.95); (0.15,0.9,0.95)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0,0.95,1); (0.3,0.75,0.8)]	[(0.15,0.9,0.95); (0.65,0.35,0.5)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]

6	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0,0.95,1); (0.3,0.75,0.8)]	[(0.49,0.5,0.55); (0.65,0.35,0.5)]	[(0.49,0.5,0.55); (0.95,0.12,0.15)]
7	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.49,0.5,0.55); (0.75,0.3,0.4)]	[(0.15,0.9,0.95); (0.15,0.9,0.95)]
8	[(0.25,0.8,0.85); (0.65,0.35,0.5)]	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0,0.95,1); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.25,0.8,0.85); (0.25,0.8,0.85)]
9	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.25,0.8,0.85); (0.75,0.3,0.4)]	[(0.49,0.5,0.55); (0.65,0.35,0.5)]	[(0,0.95,1); 0.3,0.75,0.8)]	[(0.25,0.8,0.85); (0.25,0.8,0.85)]
10	[(0.25,0.8,0.85); (0.49,0.5,0.55)]	[(0.25,0.8,0.85); (0.65,0.35,0.5)]	[(0,0.95,1); (0.3,0.75,0.8)]	[(0.15,0.9,0.95); (0.25,0.8,0.85)]	[(0.3,0.75,0.8); (0.49,0.5,0.55)]
11	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.49,0.5,0.55); (0.75,0.3,0.4)]	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0,0.95,1); (0.25,0.8,0.85)]
12	[(0.15,0.9,0.95); (0.49,0.5,0.55)]	[(0.25,0.8,0.85); (0.75,0.3,0.4)]	[(0.15,0.9,0.95); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.95,0.12,0.15)]	[(0.3,0.75,0.8); (0.95,0.12,0.15)]
13	[(0.49,0.5,0.55); (0.75,0.3,0.4)]	[(0,0.95,1); (0.15,0.9,0.95)]	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0.49,0.5,0.55); (0.95,0.12,0.15)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]
14	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.49,0.5,0.55); (0.49,0.5,0.55)]	[(0,0.95,1); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]
15	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0.15,0.9,0.95); (0.25,0.8,0.85)]	[(0.49,0.5,0.55); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]
16	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.25,0.8,0.85); (0.25,0.8,0.85)]	[(0,0.95,1); (0.3,0.75,0.8)]	[(0.15,0.9,0.95); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]
17	[(0.49,0.5,0.55); (0.75,0.3,0.4)]	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.49,0.5,0.55); (0.75,0.3,0.4)]	[(0.15,0.9,0.95); (0.25,0.8,0.85)]
18	[(0,0.95,1); (0.3,0.75,0.8)]	[(0.49,0.5,0.55); (1,0.05,0)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.49,0.5,0.55); (0.95,0.12,0.15)]	[(0.15,0.9,0.95); (0.3,0.75,0.8)]
19	[(0.15,0.9,0.95); (0.15,0.9,0.95)]	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]	[(0,0.95,1); (0.3,0.75,0.8)]
20	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.49,0.5,0.55); (0.75,0.3,0.4)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.25,0.8,0.85); (0.65,0.35,0.5)]
21	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]
22	[(0.49,0.5,0.55); (0.75,0.3,0.4)]	[(0.15,0.9,0.95); (0.25,0.8,0.85)]	[(0.49,0.5,0.55); (0.95,0.12,0.15)]	[(0.15,0.9,0.95); (0.49,0.5,0.55)]	[(0.25,0.8,0.85); (0.49,0.5,0.55)]
23	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0,0.95,1); (0.49,0.5,0.55)]
24	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.25,0.8,0.85); (0.65,0.35,0.5)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]	[(0,0.95,1); (0.25,0.8,0.85)]	[(0.25,0.8,0.85); (0.75,0.3,0.4)]
25	[(0,0.95,1); (0,0.95,1)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0,0.95,1); (0,0.95,1)]	[(0.15,0.9,0.95); (0.15,0.9,0.95)]
26	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0,0.95,1); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.95,0.12,0.15)]
27	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0,0.95,1); (0,0.95,1)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.49,0.5,0.55); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.95,0.12,0.15)]
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30	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.49,0.5,0.55); (0.95,0.12,0.15)]	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0,0.95,1); (0.3,0.75,0.8)]	[(0.49,0.5,0.55); (1,0.05,0)]
31	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0.15,0.9,0.95); (0.65,0.35,0.5)]	[(0,0.95,1); (0.3,0.75,0.8)]	[(0.49,0.5,0.55); (0.75,0.3,0.4)]	[(0,0.95,1); (0.15,0.9,0.95)]

32	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.25,0.8,0.85); (0.65,0.35,0.5)]
33	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.25,0.8,0.85); (0.49,0.5,0.55)]	[(0,0.95,1); (0.25,0.8,0.85)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]	[(0.3,0.75,0.8); (0.49,0.5,0.55)]
34	[(0.3,0.75,0.8); (0.95,0.12,0.15)]	[(0.25,0.8,0.85); (0.65,0.35,0.5)]	[(0,0.95,1); (0.15,0.9,0.95)]	[(0,0.95,1); (0,0.95,1)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]
35	[(0.15,0.9,0.95); (0.65,0.35,0.5)]	[(0.49,0.5,0.55); (0.75,0.3,0.4)]	[(0,0.95,1); (0,0.95,1)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.25,0.8,0.85); (0.65,0.35,0.5)]
36	[(0.25,0.8,0.85); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0,0.95,1); (0.3,0.75,0.8)]	[(0,0.95,1); (0,0.95,1)]	[(0.15,0.9,0.95); (0.65,0.35,0.5)]
37	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0.25,0.8,0.85); (0.65,0.35,0.5)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.49,0.5,0.55); (0.65,0.35,0.5)]	[(0.25,0.8,0.85); (0.65,0.35,0.5)]
38	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0.15,0.9,0.95); (0.65,0.35,0.5)]
39	[(0.49,0.5,0.55); (0.95,0.12,0.15)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.49,0.5,0.55); (0.95,0.12,0.15)]	[(0,0.95,1); (0.15,0.9,0.95)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]
40	[(0.49,0.5,0.55); (1,0.05,0)]	[(0.49,0.5,0.55); (1,0.05,0)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.49,0.5,0.55); (1,0.05,0)]
41	[(0.3,0.75,0.8); (0.65,0.35,0.5)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0,0.95,1); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.25,0.8,0.85); (0.49,0.5,0.55)]
42	[(0,0.95,1); (0.49,0.5,0.55)]	[(0.49,0.5,0.55); (0.49,0.5,0.55)]	[(0,0.95,1); (0.25,0.8,0.85)]	[(0.49,0.5,0.55); (0.49,0.5,0.55)]	[(0.15,0.9,0.95); (0.15,0.9,0.95)]
43	[(0.25,0.8,0.85); (0.65,0.35,0.5)]	[(0.25,0.8,0.85); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.95,0.12,0.15)]
44	[(0.25,0.8,0.85); (0.25,0.8,0.85)]	[(0,0.95,1); (0.3,0.75,0.8)]	[(0.15,0.9,0.95); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]
45	[(0.15,0.9,0.95); (0.25,0.8,0.85)]	[(0.25,0.8,0.85); (0.25,0.8,0.85)]	[(0.49,0.5,0.55); (0.75,0.3,0.4)]	[(0.25,0.8,0.85); (0.49,0.5,0.55)]	[(0.15,0.9,0.95); (0.25,0.8,0.85)]
46	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.95,0.12,0.15)]	[(0,0.95,1); (0.25,0.8,0.85)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.15,0.9,0.95); (0.3,0.75,0.8)]
47	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]	[(0.49,0.5,0.55); (0.95,0.12,0.15)]	[(0.25,0.8,0.85); (0.75,0.3,0.4)]	[(0.49,0.5,0.55); (0.65,0.35,0.5)]
48	[(0,0.95,1); (0.25,0.8,0.85)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.15,0.9,0.95); (0.25,0.8,0.85)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]
49	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.49,0.5,0.55); (0.75,0.3,0.4)]	[(0.15,0.9,0.95); (0.49,0.5,0.55)]	[(0.49,0.5,0.55); (0.75,0.3,0.4)]
50	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.25,0.8,0.85); (0.25,0.8,0.85)]	[(0.15,0.9,0.95); (0.65,0.35,0.5)]
51	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.15,0.9,0.95); (0.49,0.5,0.55)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0,0.95,1); (0,0.95,1)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]
52	[(0.25,0.8,0.85); (0.49,0.5,0.55)]	[(0,0.95,1); (0,0.95,1)]	[(0.49,0.5,0.55); (1,0.05,0)]	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0,0.95,1); (0.49,0.5,0.55)]
53	[(0,0.95,1); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]	[(0.49,0.5,0.55); (0.75,0.3,0.4)]	[(0.15,0.9,0.95); (0.65,0.35,0.5)]	[(0,0.95,1); (0.3,0.75,0.8)]
54	[(0,0.95,1); (0.3,0.75,0.8)]	[(0.15,0.9,0.95); (0.49,0.5,0.55)]	[(0.49,0.5,0.55); (0.95,0.12,0.15)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]
55	[(0.49,0.5,0.55); (0.95,0.12,0.15)]	[(0.49,0.5,0.55); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0,0.95,1); (0.25,0.8,0.85)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]
56	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.15,0.9,0.95); (0.25,0.8,0.85)]	[(0.49,0.5,0.55); (0.49,0.5,0.55)]	[(0.49,0.5,0.55); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.95,0.12,0.15)]

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57	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0.49,0.5,0.55); (0.65,0.35,0.5)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.15,0.9,0.95); (0.3,0.75,0.8)]
58	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.25,0.8,0.85); (0.49,0.5,0.55)]	[(0.49,0.5,0.55); (1,0.05,0)]	[(0.49,0.5,0.55); (0.95,0.12,0.15)]
59	[(0.49,0.5,0.55); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0.25,0.8,0.85); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]
60	[(0.49,0.5,0.55); (0.49,0.5,0.55)]	[(0,0.95,1); (0.3,0.75,0.8)]	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0.25,0.8,0.85); (0.25,0.8,0.85)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]
61	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.25,0.8,0.85); (0.25,0.8,0.85)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]	[(0.15,0.9,0.95); (0.49,0.5,0.55)]	[(0.15,0.9,0.95); (0.49,0.5,0.55)]
62	[(0,0.95,1); (0.49,0.5,0.55)]	[(0.25,0.8,0.85); (0.65,0.35,0.5)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.15,0.9,0.95); (0.25,0.8,0.85)]	[(0.25,0.8,0.85); (0.65,0.35,0.5)]
63	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0,0.95,1); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]
64	[(0.49,0.5,0.55); (0.95,0.12,0.15)]	[(0.49,0.5,0.55); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.49,0.5,0.55); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]
65	[(0.49,0.5,0.55); (0.95,0.12,0.15)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]	[(0,0.95,1); (0,0.95,1)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]
66	[(0.15,0.9,0.95); (0.65,0.35,0.5)]	[(0.25,0.8,0.85); (0.65,0.35,0.5)]	[(0.15,0.9,0.95); (0.49,0.5,0.55)]	[(0.15,0.9,0.95); (0.25,0.8,0.85)]	[(0.49,0.5,0.55); (0.75,0.3,0.4)]
67	[(0.49,0.5,0.55); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0,0.95,1); (0.3,0.75,0.8)]	[(0.25,0.8,0.85); (0.49,0.5,0.55)]	[(0.49,0.5,0.55); (1,0.05,0)]
68	[(0,0.95,1); (0.3,0.75,0.8)]	[(0.15,0.9,0.95); (0.65,0.35,0.5)]	[(0.49,0.5,0.55); (1,0.05,0)]	[(0,0.95,1); (0.15,0.9,0.95)]	[(0.3,0.75,0.8); (0.49,0.5,0.55)]
69	[(0,0.95,1); (0.25,0.8,0.85)]	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]	[(0.49,0.5,0.55); (0.95,0.12,0.15)]
70	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.25,0.8,0.85); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.95,0.12,0.15)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.15,0.9,0.95); (0.49,0.5,0.55)]
71	[(0.49,0.5,0.55); (1,0.05,0)]	[(0.15,0.9,0.95); (0.15,0.9,0.95)]	[(0,0.95,1); (0.25,0.8,0.85)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]
72	[(0.25,0.8,0.85); (0.25,0.8,0.85)]	[(0.15,0.9,0.95); (0.49,0.5,0.55)]	[(0,0.95,1); (0.49,0.5,0.55)]	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0.49,0.5,0.55); (0.75,0.3,0.4)]
73	[(0.25,0.8,0.85); (0.25,0.8,0.85)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]	[(0.49,0.5,0.55); (0.49,0.5,0.55)]	[(0.49,0.5,0.55); (0.95,0.12,0.15)]	[(0.3,0.75,0.8); (0.49,0.5,0.55)]
74	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0,0.95,1); (0,0.95,1)]	[(0.25,0.8,0.85); (0.65,0.35,0.5)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]	[(0,0.95,1); (0.3,0.75,0.8)]
75	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0,0.95,1); (0,0.95,1)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.65,0.35,0.5)]
76	[(0,0.95,1); (0.25,0.8,0.85)]	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0.49,0.5,0.55); (0.75,0.3,0.4)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]
77	[(0.25,0.8,0.85); (0.65,0.35,0.5)]	[(0.15,0.9,0.95); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.75,0.3,0.4)]	[(0.15,0.9,0.95); (0.25,0.8,0.85)]	[(0.25,0.8,0.85); (0.75,0.3,0.4)]
78	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0.25,0.8,0.85); (0.49,0.5,0.55)]	[(0.49,0.5,0.55); (0.95,0.12,0.15)]	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0,0.95,1); (0.3,0.75,0.8)]
79	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0,0.95,1); (0,0.95,1)]	[(0.3,0.75,0.8); (0.95,0.12,0.15)]	[(0.3,0.75,0.8); (0.3,0.75,0.8)]	[(0.49,0.5,0.55); (1,0.05,0)]
80	[(0,0.95,1); (0.3,0.75,0.8)]	[(0,0.95,1); (0.3,0.75,0.8)]	[(0,0.95,1); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0,0.95,1); (0.15,0.9,0.95)]
1-80	[(0.3,0.75,0.8); (0.49,0.5,0.55)]	[(0.25,0.8,0.85); (0.3,0.75,0.8)]	[(0.3,0.75,0.8); (0.55,0.45,0.53)]	[(0.25,0.8,0.85); (0.49,0.5,0.55)]	[(0.3,0.75,0.8); (0.55,0.45,0.53)]

			]		

For the development of the statistical study, the neutrosophic frequencies of the factors are analyzed to determine the level of deterioration of the element that affects pregnancy in adolescence in Ecuador, associated with risk conditions. For each factor, the specialists analyze a sample of the elements associated with the surrounding environment of the pregnant adolescent. The analysis of the sample that makes up the groups analyzed in the study with respect to determining the relationship between the deterioration of the elements and the associated risk condition (table 3).

For the modeling, it is decided to take each term to a neutrosophic number according to equation (1). Table 3 analyzes the level of DPEA for a sample of [45;80] pregnant adolescents in Ecuador for each factor analyzed. Of the neutrosophic frequencies, it can be observed with a level of response in the weight of the factors, from the neutrosophic linguistic terms represented between $[0; 1]$. For each risk condition reviewed with a total indeterminacy level of $L = 19.7, R = 18.7, N = 22.6, I = 20.1, P = 22.3$, and with a representativeness level of $[49.21\%; 51.86\%]$, on the days that adolescent pregnant women affected by more than one risk condition are evaluated.

The preliminary screening results have an indeterminacy level close to 0.5 per analyzed factor, in all factors, except for F2. The result diagnoses the deterioration of each factor that affects the appearance of pregnant adolescents according to the analyzed sample:

● For the malnutrition index, it is very slightly moderate, while the poverty level is medium for the interaction of the analyzed subsets.

● The emotional state is in a state of fear in front of a low level of acceptance at that stage of life.

● The academic level is low with some indeterminacy to continue studies

● The impact on the family is very bad with a slight influence on society

● The preparation is very low for the new environment that surrounds them, while there is a certain indeterminacy in the responsibility of future teenage mothers.

Given the existing levels of indeterminacy, the use of classical statistics is not possible, so it is necessary to use neutrosophic statistics for a better understanding of interrelated neutrosophic sets.

Neutrosophic Statistical Analysis:

The modeling of the data on the level of deterioration existing in the factors associated with the origin of pregnancy in adolescents shows that factors 3 and 5 require studies with a level of depth. To determine the level of incidence between the causes and the risk conditions in pregnancy, it is necessary to analyze the means (Table 4). To understand which factor implies a representative mean$\underline{x} = \in [\underline{x}_L; \underline{x}_U]$, the values of the neutrosophic means are calculated for the study of the variations of the affectations, and the values of the standard neutrosophic deviation$S_N \in [S_L; S_U]$. To determine which factor requires a higher level of accuracy at the time of diagnosing each subset, therefore, the values are calculated.

Table 5: Neutrosophic statistical analysis of DPEA level. Source: Own elaboration

Factors	$\underline{x}_N$	S_N	CV_N
Socio-economic status	0.254 + 0.5I	0.015 + 0.315 I	0.059 + 0.63 I
Adolescent reaction to pregnancy	0.241 + 0.475 I	0.013 + 0.315 I	0.054 + 0.663 I
Level of sexual education and	0.258 + 0.54 I	0.018 + 0.324 I	0.07 + 0.6 I

continuity of studies			
Influence on the family and social environment	0.239 + 0.49 I	0.016 + 0.334 I	0.067 + 0.682 I
Preparation and responsibility of the adolescent when caring for the son or daughter	0.259 + 0.538 I	0.014 + 0.326 I	0.054 + 0.606 I

Table 4 shows the factors that affect the risk conditions in pregnant adolescents and the associated level of indeterminacy. So it is necessary to analyze the current state of adolescents and propose solutions to mitigate their impact on society. This means that the level of risk associated with this risk situation is more common and easier to detect, but there are levels of uncertainty to analyze. On the other hand, the analysis of CV_{ND} for these factors is lower for the preparation and responsibility factors of the adolescent in caring for the son or daughter and the adolescent's reaction to the pregnancy.
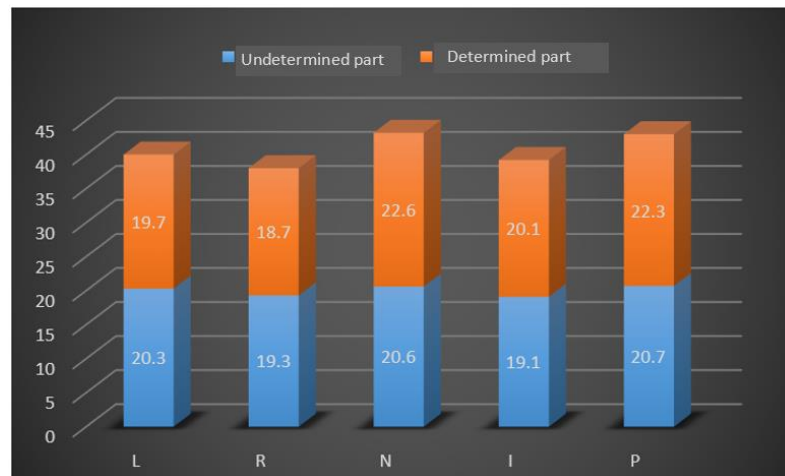

Figure 1: Neutrosophic bar graph of the DPEA.

The neutrosophic set for the *level of sexual education and continuity of studies* derives with a greater frequency from the analyzed studies. While the set *preparation and responsibility of the adolescent to care for the son or daughter* coexists a direct relationship between sets. It is visualized that, low levels of sexual educationlead to an increase in adolescent pregnancy, where preparation and responsibility are defined in a contradictory way, and the risk conditions in pregnancy increase (Figure 1).

Comparative analysis:

To determine the associated referent indeterminacy measure for $\underline{x} = \in [\underline{x}_L; \underline{x}_U], S_N \in [S_L; S_U]$ and $CV_N \in [CV_L ; CV_U]$ to the form of neutrosophic numbers (Table 5). In the results obtained, it is observed that the values CV_N range from 0.054 to 0.07 with the indeterminacy measure of [0.6;0.682] generated by a sample of [100;203] questionnaires and statistical information, obtained from 80 pregnant adolescents. From the results expected by the neutrosophic study, it can be seen that:

- The prevalence of low socio-economic status in the family causes a low level of malnutrition and poverty in 19.7% of the respondents. The status of the factor analyzed in

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pregnant adolescents is between severely impaired and moderately impaired for a frequency of [20.3; 40].

- The adolescent's reaction to pregnancy is visualized with an emotional state of fear and a low level of acceptance for 18.7% of pregnant adolescents. The state of impairment of the factor is between very impaired and severely impaired for a frequency of [19.3; 38].

- The level of sexual education and the continuity of studies in pregnant adolescents is present in only 21.2% of the respondents. The low educational level on sexuality is severely deteriorated and deteriorated with a level of indeterminacy of 88.3% for a frequency of [20.6; 43.2].

- The influence in the family and social environment is present in 19.3% of pregnant adolescents. The continuous effect caused in society is due to the low level that influences families in preparing adolescents for sexual life. This fact means that the factor is found on a scale between moderately impaired and highly impaired for a frequency of [19.1; 39.2].

- The preparation and responsibility of the adolescent when caring for the son or daughter responds to 20.7% of the pregnant women surveyed. It is defined that for a deterioration of the factor between severely impaired and impaired, it leads to a low level of responsibility towards the son or daughter of the adolescent, for a frequency of [20.7; 43].

- The risk conditions in adolescent pregnant women increase with the deterioration of the analyzed factors. For these clinical conditions, deeper studies are required to track down the potential causes, such as the mitigation of the consequences that affect health. It is vital, for the analysis of statistical studies referring to the subject where the contradictions and indeterminacies are diversified in various degrees of weight in neutrosophic terms, to obtain a level of consensus of the specialists within the analyzed element of the neutrosophic set.

Table 6: Neutrosophic forms with a measure of indeterminacy

Factors	$\underline{x}_N$	S_N	CV_N
F1	$0.254 + 0.5I; I \in [0,0.492,0]$	$0.015 + 0.315I; I \in [0,0.952,0]$	$0.059 + 0.63I; I \in [0,0.906,0]$
F2	$0.241 + 0.475I; I \in [0,0.493,0]$	$0.013 + 0.315I; I \in [0,0.959,0]$	$0.054 + 0.663 I; I \in [0,0.919,0]$
F3	$0.258 + 0.54I; I \in [0,0.522,0]$	$0.018 + 0.324I; I \in [0,0.954,0]$	$0.07 + 0.6I; I \in [0,0.883,0]$
F4	$0.239 + 0.49 I; I \in [0,0.512,0]$	$0.016 + 0.334 I; I \in [0,0.952,0]$	$0.067 + 0.682 I; I \in [0,0.902,0]$
F5	$0.259 + 0.538 I; I \in [0,0.519,0]$	$0.014 + 0.326I; I \in [0,0.957,0]$	$0.054 + 0.606 I; I \in [0,0.911,0]$

From the results obtained in the study, it is proposed to promote alternatives based on the existing situation of pregnant adolescents. The variants presented allow the actions to be taken based on the level of indeterminacy and acceptance of the levels in each range and for the screening of health problems in pregnant women. Therefore you want:

- Implement promotional preventive programs with greater emphasis on pregnancy in adolescence, causes, and consequences based on the risk conditions present in the stage.

- Encourage interaction between parents and children to discuss sexual education issues.

- Work together with governing bodies to visualize strategies to mitigate the risks associated with pregnancy in adolescence and the impact caused on society.

- Create educational policies, campaigns, and awareness that lead to the use of contraceptive resources and the flow of information in society to prevent pregnancy in adolescence.

3. Conclusions

Teenage pregnancies are considered a social problem that occurs and in turn generate poverty and inequality. It is also considered an obstacle to adolescents' social and personal development. In most cases, pregnancy at this stage of life occurs due to social, personal, and socio-economic determinants without taking into account the risks of early pregnancy for both the future mother and the fetus.

The modeling of neutrosophic statistics defines as the best prevention that young people have a good sexual education from within the family. Inform about the risks and complications of pregnancy in adolescence and all the changes that will occur when the adolescent becomes pregnant. Guidance should be given on the level of responsibility required to be a mother.

Communication in the family is essential; therefore, there must be open and transparent dialogue so that young people have all the information at their fingertips. In addition, adolescents must have universal access to comprehensive sexuality education, for free decision-making, through the full exercise of sexual and reproductive rights for a life free of violence. Therefore, it is up to the governing bodies to use strategies so that adolescents go to health centers and thus promote an active sexual life responsibly and without the risk of early pregnancy.

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