Neutrosophic Analysis of Nutritional Orientation in University Students

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Abstract. In the present study, Neutrosophy is used for the analysis of the nutritional orientation of university students. Since this approach is the least treated in the specialized scientific literature, the research arises because of the potential of Neutrosophy in the evaluation of this topic is little used. The objective of the research is to carry out a neutrosophic analysis of nutritional orientation in university students. For this purpose, methods, and techniques from sciences in general, and Neutrosophy, in particular, were used. Theoretical, empirical, and mathematical-statistical methods and techniques were also used. After applying these instruments, the results obtained denote little knowledge of the students about nutritional orientation. Which is the reason that leaves open future lines of research on this topic.

Keywords: neutrosophic analysis, neutrosophic statistics, neutrosophic chart, nutritional orientation.

1 Introduction

Nutrition is a key factor in maintaining and promoting human health and, therefore, malnutrition is both a cause and a consequence of health problems, so its identification and treatment can prevent complications or relapses in underlying pathologies, as well as accelerate recovery. In addition, to maintain an adequate quality of life [1], [2].

Since the 1990s, the School of Nutrition of the University of Costa Rica (UCR) has been designing nutrition education methods that have been evolving. In 1996, Anne Chinnock and Indira deBeausset, based on the principles of constructivist education, proposed an educational methodology for nutritionists; this evolved and began to be called Interactive Nutrition Education because it is based on participation and dialogue with people collaborating in groups to learn.

Enteral nutrition (EN) is understood as that nutrition support care in which a liquid feeding formula is administered directly into the gastrointestinal (GI) tract to supplement or provide all caloric requirements to the individual [3], [4], [18].

In correspondence with the postulates stated above, it is evident that an adequate nutritional orientation is in favor of a healthy lifestyle in different population groups. However, it is also important for young people, since this age group is mostly attending university. A reason that demands a significant energy expenditure, so it is required that university students know this subject.

Based on the above criteria and in order to corroborate them, a diagnosis was made on students of the medical school of the Regional Autonomous University of the Andes (UNIANDES), in Ecuador, with the application of scientific observation. A group of limitations were identified and are summarized as follows:

✓ Little use of the potential of Neutrosophy in the evaluation of knowledge about nutritional orientation in undergraduate medical students.

✓ Limited use of neutrosophic models for the assessment of nutritional counseling knowledge in undergraduate medical students

Based on the above arguments, the following research problem is identified: insufficient use of neutrosophic methods and techniques limits the evaluation of knowledge on nutritional orientation in university students of medicine at UNIANDES Ecuador.

Therefore, the following research objective is formulated: to carry out a neutrosophic analysis of the nutritional

orientation of university students in the medical school at UNIANDES Ecuador.

2 Methodology

2.1 Subjects under study

A neutrosophic sample is a chosen subset of a population, a subset that contains some indeterminacy: either with respect to several of its individuals (who may not belong to the population we are studying or may only partially belong to it) or with respect to the subset as a whole. While classical samples provide precise information, neutrosophic samples provide vague or incomplete information [5].

Following this postulate of the creator of Neutrosophy, the calculation of the sample under study is carried out. For this purpose, we follow the suggestions of authors such as [6, 19, 20, 23], who propose to do it as it was done in the present research.

The starting point is to identify that p = approximate proportion of the phenomenon under study in the reference population, q = proportion of the reference population that does not present the phenomenon under study (1 -p). The desired confidence level (Z), indicates the degree of confidence that the true value of the parameter in the population will be found in the calculated sample. The absolute precision (d). It is the desired width of the confidence interval on both sides of the true value of the difference between the two proportions (in percentage points). N is the size of the population. Criteria shared from [7], [8].

In this case a confidence level between 90 and 95% is desired, z= [1.645, 1.96], d= [0.05, 0.0] and p = [0.4, 0.41], N=41. The result we call the neutrosophic sample n= [10.1, 30.6] indicates that the sample should be between 10 and 31 individuals.

For this reason, 18 university students from the medical school of the Regional Autonomous University of the Andes, in Ecuador, were chosen for this research. They were randomly selected, using the token procedure as indicated by authors such as [9], [10], [11], [17], [21].

The sample has an average age of 25.8 years, of which 10 are female and 8 are male. All of them have already completed and passed the third year of their degree and signed the informed consent form to participate in the study.

2.2 Instruments used

During the research process, methods and techniques from both general and neutrosophic sciences were used. Among the former are the theoretical ones such as the analytical-synthetic and the inductive-deductive. Both were useful for the work with the bibliographic sources and to make inferences from these with the results of the present research. Among the empirical ones, there is the survey and observation, the former was used to collect data from the students regarding the research topic, and the latter to identify the research problem in a facto-perceptual way.

On the other hand, statistical and mathematical methods were used, particularly descriptive statistics and within this the frequency distribution. Within these, the neutrosophic measures of central tendency were used, such as the mean. In addition, neutrosophic graphs were used to illustrate the results obtained. [24], [25], [26]

2.3 Neutrosophic method

For the research, the following neutrosophic model is followed, which serves as a guide for the realization of the scientific research:

Step 1. Identification of the problem to be investigated

Step 2. Selection of the main data collection technique

Step 3. Preparation of the personnel who will implement the methods and techniques.

Step 4. Selection of the study sample

Step 5. Selection of application schedule

Step 5. Application of the instruments

Step 6. Neutrosophication of the data

Step 7. Analysis and interpretation of results.

3 Results

In this section, the results obtained in the research are presented, where a frequency distribution analysis is carried out first, and then descriptive neutrosophic statistics are applied to determine the mean number of students who stated that they knew about adequate nutritional orientation.

Table 1 shows the results of the four questions of the survey applied to the students. These will be analyzed individually below for a better understanding of the analysis.

Questions	"Yes" Answers	Percentage of "Yes" Answers	"No" Answers	Percentage of "No" Answers
1	5	27,7	13	72,3
2	7	38,8	11	61,2
3	4	22,3	14	77,7
4	3	16,6	15	83,4

Table 1: Results of the student survey.

Results of question 1. General nutrition knowledge for young students.

As shown in Table 1, there is a minority group of students who stated that they had general knowledge about nutrition for young students. This was reflected in the fact that 5 of them (27.7%) selected this option. However, it is noteworthy that the majority of them, 13 (72.3%), stated that they did not. This shows that the sample under study has little knowledge about this question.

Results of question 2. Do you know the number of nutrients that a university student of your specialty should consume?

Only 7 students (38.8%) stated that they knew the number of nutrients that a university student of their specialty should consume. Most of these students reported the opposite (11 for 61.2%), which shows that the students do not have much knowledge about this, which makes them a risk factor group for obesity.

Results of question 3. Have you received any type of nutritional orientation?

Same as with the previous questions, only a minority of students are aware of the content of the question. This is shown by the fact that only 4 students (38.8%). While the option was not the most indicated by the students, as 14 for 61.2% indicated so. This leaves the line open for future research on the preparation of students in this content.

Results of question 4. Do you know some of the ways to calculate the energy expenditure of a university student?

Similarly, only a minority of students stated that they were familiar with some of the ways of calculating the energy expenditure of a university student, in this case, this was reflected in the fact that 3 (16.6%) indicated this option. On the other hand, the majority of students stated that they did not know them, with 15 (83.4%). This shows, as in the previous questions, that students have a low level of nutritional orientation.

To each of the questions in the survey, an item was added referring to the fact that if your answer is positive, argue why you selected this option. This gave rise to the suggestion of a group of students who showed indeterminacy as to the reason for their answers. This is represented in a neutrosophic graph (Figure 1), according to the criteria of [12], [13], [14], [22]. The one that shows the relationship between students who said yes and the indeterminacy of the reason for their answers.
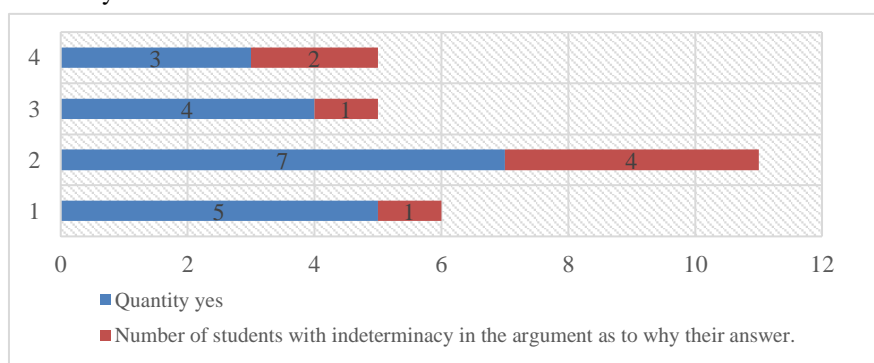
Figure 1: Neutrosophic graph. Number of students who expressed a positive response and the level of indeterminacy of their response.

When analyzing the 4 questions of the survey applied to the students, it is obtained that in question 1, 1 student expressed indeterminacy in his answers, in question 2 there were 4 students. On the other hand, in question 3, 1 student expressed it, and in question 4, only 2 students.

After the analysis of frequency distribution presented, it is necessary to calculate the mean of the data recorded to know this statistical indicator of the students who stated that they know the subject, taking into consideration the 4 questions asked to the university students, where there are students with indeterminacy in the argument of why they marked this option. Quantities containing an indeterminacy component are represented as classical neutrosophic numbers, of the form: N= a + Bi, according to [12], [15]:

Questions	Number of "yes" answers
1	5+1
2	7+4
3	4+1
4	3+2

Table 2: Results of the data for positive responses and indeterminacy.

To calculate the mean of these values, the same equation is applied as in classical statistics, taking into account the particularities of operations with neutrosophic numbers.

$$\bar{x}_N = \frac{(5 + 1I) + (7 + 4I) + (4 + 1I) + (3 + 2I)}{4}$$

$$\bar{x}_N = \frac{5 + 7 + 4 + 3}{4} + \frac{1 + 4 + 1 + 2}{4} \cdot I$$

$$\bar{x}_N = 4{,}7 + 4I$$

$$\bar{x}_N = 8{,}7$$

Therefore, the mean of the data obtained was 8.7, out of a sample of 18 students, only these were the mean of all the questions answered that they had nutritional orientation [16]. Therefore, the application of other investigations is demanded in order to achieve an important transformation in the studied sample.

Conclusion

The results derived from the theoretical study allow confirming the potential of neutrosophic studies for the evaluation of knowledge about nutritional orientation in university students of medicine at UNIANDES, Ecuador.

The results obtained in the research make evident the lack of knowledge of medical students about nutritional orientation, leaving open future lines of research on this topic.

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