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Evaluation of Assertive Communication Competencies in Nurses using Neutrosophic Statistics

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Abstract. Assertiveness, as an important element of interpersonal competency, is essential in effective conflict resolution. The nursing profession is associated with intense contacts in the therapeutic team, so this profession recognizes the need to use an assertive attitude, which allows defending one's dignity, expressing opinions and emotions for another person. This research aims to assess the assertive competencies of nurses in the city of Guayaquil through neutrosophic statistics. The neutrosophic population proportion was estimated with 99% of reliability, which leads us to conclude that assertive communication skills in nurses in the city of Guayaquil are generally very good in terms of empathy and the ability to work with emotions, assertiveness in conflict situations, and communication skills.

Keywords: Assertive communication, nursing, neutrosophic statistics, neutrosophic confidence interval.

1 Introduction

Nursing is a profession that requires adequate medical knowledge, responsibility, resistance to stress, patience, reliability, and the ability to act as part of a medical team consisting of co-workers and patients [1, 2]. In this profession, the development of social skills is very important.

The main social competencies, understood as the ability to face desired interpersonal relationships, in nursing work include interpersonal communication, empathy, and assertiveness in conflict situations [5, 8]. According to [10], assertiveness turns out to be the most important and useful interpersonal communication competency to solve problems and conflicts between members of the therapeutic team.

Assertiveness is the ability to formulate and communicate your thoughts, opinions, and wishes, directly, and non-aggressively. Its goal is to effectively initiate social interactions so that positive interpersonal relationships can be maintained. It is also the facility to say "no" in situations that exceed our expectations, competency, or capabilities. It allows us to maintain the boundaries between the interlocutors. The ability to assertively express negative emotions is an expression of respect for oneself and other interlocutors. Thanks to assertiveness, communication becomes sincere and open, which makes each of its participants feel satisfied and not offended [3].

The concept of assertiveness is defined slightly differently by social competency training professionals and humanistic psychologists. They point out that a person will be truly assertive when he trusts himself deeply and, feeling self-acceptance, rationally trusts other people with whom he will be authentic, sincere, open, and honest. The authors of this approach to the topic indicate that the assertive person expresses a mature and integrated personality and that assertive behavior is dictated by an awareness of personal dignity, self-respect, and self-acceptance. Therefore, it is not a manifestation of selfishness, and can even serve to achieve prosocial goals [2].

Assertiveness can be confused with aggressiveness, especially at work. However, the main difference between assertiveness and aggression is the approach to the situation or problem. An assertive person faces the difficulty instead of the interlocutor so that everyone respects each other. An aggressive attitude, on the other hand, will have little effect in changing the thoughts and feelings of others to solve the problem and an assertive person does not respect moral and personal limits during a conversation. The situation is reversed when the interlocutor uses assertive conflict resolution skills [5].

According to the World Health Organization, one of the five factors necessary for a healthy and happy life is effective communication [10]. The ability to communicate properly and to be assertive is invaluable in the medical profession as it involves intense interpersonal contact.

The work of a nurse also requires great responsibility, the need to make immediate decisions, direct contact with patients and their emotions, and shift work, that is, sleep deprivation. The mental workload usually affects the emotional sphere, so that the mentioned stressors do not infrequently cause mental health problems, depression, and job burnout. With good communication and an assertive attitude, these side effects can be avoided. This behavior allows us to cope with stress and is a form of emotional self-control. Being assertive in stressful situations gives us greater confidence in ourselves, in addition to inspiring respect for ourselves.

In addition, proper cooperation in the treatment team will affect satisfaction with professional life and mental health, as well as patient satisfaction and safety. On a professional level, assertiveness will help maintain the task-oriented nature of relationships between coworkers, and assertiveness will reinforce belief in specialized competencies and one's abilities. In addition, an assertive refusal allows one to transgress professional competency with tact, without offending the other party. Relationships in the therapeutic team that function in this way leads to mutual satisfaction, in which everyone respects each other, do not exceed personal limits and, as a result, the roles of the medical staff are appropriately divided [2, 4].

In short, an assertive nurse knows how to achieve what he expects from the environment with respect for others. He is a person who speaks openly, honestly, and directly about his personal feelings and thoughts with great tact. Assertiveness is used to defend one's position and the professional position. Thanks to this ability, he solves conflicts and problems without using aggressiveness, which gives him a sense of dignity. An assertive nurse inspires confidence both in your person and in your professional competency. He takes responsibility for his words and does not violate the rights of the patient, taking into account their expectations. By using assertive messages, you can deal with stress and avoid professional burnout, to which the medical profession is most exposed [1, 5].

Multiple research works have been carried out to evaluate assertive communication competencies in health professionals and in particular in nursing. Among them, the investigations of [1], [2], [4], [5], and [14] stand out.

The objective of this study is to evaluate the assertive communication skills of nurses in the city of Guayaquil, using neutrosophic statistics. We decided to choose neutrosophic statistics because it allows us to interpret and organize data that may be ambiguous, vague, imprecise, incomplete, or even unknown, to reveal the underlying patterns [12, 13].

2 Materials and methods

This section offers some of the definitions of Neutrosophy and neutrosophic statistics that are used in this research. The instrument and the procedure applied for the selection of the sample, the processing, and the analysis of the data are also detailed.

Let X be a universe of discourse, a Single Value Neutrosophic Set (SVNS) A over X has the following form [11-14]:

$$A = \{\langle x, u_a(x), r_a(x), v_a(x)\rangle : x \in X\}d \quad (1)$$

Where

$u_a(x): X \to [0,1], r_a(x): X \to [0,1]\ y\ v_a(x): X \to [0,1]$

with

$$0 \leq u_a(x), r_a(x), v_a(x) \leq 3, \forall\ x \in X$$

The intervals $u_a(x), r_a(x)$ y $v_a(x)$ denote the memberships to true, indeterminate, and false from x in A, respectively. For convenience a SVNS will be expressed as A = (a, b, c), where a, b, c ∈ [0.1] and satisfies 0 ≤ a + b + c ≤ 3. Let $\{A_1, A_2, \dots, A_n\} \in$ SVNS(x), where $A_j = (a_j, b_j, c_j)$ (j = 1, 2, …, n), then, the Single Valued Neutrosophic Weighted Average Operator is defined by:

$$P_w(A_1, A_2, \dots, A_n) = \langle 1 - \prod_{j=1}^{n}\left(1 - T_{A_j}(x)\right)^{w_j}, \prod_{j=1}^{n}\left(I_{A_j}(x)\right)^{w_j}, \prod_{j=1}^{n}\left(F_{A_j}(x)\right)^{w_j}\rangle \quad (2)$$

Where: $w = (w_1, w_2, \dots, w_n)$ is vector of $A_j (j = 1,2, \dots, n)$ such that $w_n \in [0,1]$ y $\sum w_j = 1$.

5. Let A = (a, b, c) be a single neutrosophic number, a score function S of a single-valued neutrosophic value, based on the truth-membership degree, indeterminacy-membership degree, and falsity membership degree is defined by:

$$S(A) = \frac{1+a-2b-c}{2} \quad (3)$$

Where: $S(A) \in [-1,1]$

Neutrosophic Statistics refers to a set of data so that the data or a part of them are indeterminate to some degree and to the methods used to analyze the data [15-21]. A Neutrosophic Frequency Distribution is a table showing the categories, frequencies, and relative frequencies with some indeterminacies. Most of the time, indeterminacies occur due to imprecise, incomplete, or unknown frequency-related data. As a consequence, the relative frequency also becomes imprecise, incomplete, or unknown [15]. A neutrosophic statistical number has the form [15]:

$$N = d + i \quad (4)$$

with $i \in [i_a, i_b]$

Where

d: is the determinate (sure) part of N,

i: is the indeterminate (unsure) part of N.

i_a: is the lower limit of i range

i_b: is the superior limit of i range

So (4) is equivalent to:

$[N + i_a, N + i_b]$

Setting and, the expression we will use to represent the estimated neutrosophic frequencies is: $min_{nf} = N + i_a max_{nf} = N + i_b$

$$\left[min_{nf}, max_{nf}\right] \quad (5)$$

To calculate the total of the neutrosophic frequencies, we calculate the minimum and maximum total of m categories of estimated frequencies using the following equations:

$$tmin_{nf} = \sum_{j=1}^{m} min_{nfj} \quad (6)$$

$$tmax_{nf} = \sum_{j=1}^{m} max_{nfj} \quad (7)$$

Where:

$tmin_{nf}$ is the total minimum of the estimated frequencies for m possibilities.

$tmax_{nf}$ is the total maximum of the estimated frequencies for m possibilities.

min_{nfj} is the lower limit of the neutrosophic estimated frequency range for the possibility j.

max_{nfj} is the superior limit of the neutrosophic estimated frequency range for the possibility j.

To calculate the neutrosophic relative frequency of each possibility:

$$min_{nrfj} = \frac{min_{nfj}}{tmax_{nf}} \quad (8)$$

$$max_{nrfj} = \frac{max_{nfj}}{tmin_{nf}} \quad (9)$$

Where:

min_{nrfj} is the inferior limit of the neutrosophic relative frequency for the possibility j.

max_{nrfj} is the superior limit of the neutrosophic relative frequency for the possibility j.

The large sample Neutrosophic Confidence Interval for the population proportion is calculated:

$$p - (z\ critical\ value) \cdot \sqrt{\frac{p(1-p)}{n}} < \pi < p + (z\ critical\ value) \cdot \sqrt{\frac{p(1-p)}{n}} \quad (10)$$

For the case when: and$min\{np\} \geq 5 min\{n \cdot (1-p)\} \geq 5$

Where:

p = proportion of the sample = number of individuals in the sample who possess the property of interest divided by the size of the sample;

n = sample size;

π = proportion of the population = number of individuals in the population who own the property of interest divided by the size of the population.

The formula for calculating the sample size for a finite population

$$n = \frac{Z^2 pqN}{e^2(N-1)+Z^2 pq} \quad (11)$$

The Assertive Communication Questionnaire developed by [3] was used, which consists of 19 statements. The statements were evaluated on the scale of linguistic terms associated with SVNS that are presented in Table 1.

Linguistic term	Evaluation	SVNS
Always	AL	(1,0,0)
Usually	US	(0.8, 0.15, 0.20)
Many times	MT	(0.60, 0.35, 0.40)
Sometimes	ST	(0.50, 0.50, 0.50)
On a few occasions	FO	(0.40, 0.65, 0.60)
Rarely	RA	(0.20, 0.85, 0.80)
Never	NE	(0; 1; 1)

Table 1. Linguistic terms used in the questionnaire and their associated SVNS

With the results obtained in the survey, each respondent was evaluated on the dimensions: 1) Empathy and

ability to work with emotions, 2) Assertiveness in conflict situations and 3) Communication skills. These dimensions were evaluated according to the scale of linguistic terms associated with SVNS shown in Table 2.

Linguistic term	Evaluation	SVNS
Excellent	E	(1,0,0)
Very good	VG	(0.8, 0.15, 0.20)
Good	G	(0.60, 0.35, 0.40)
Regular	R	(0.50, 0.50, 0.50)
Regular tending to bad	RB	(0.40, 0.65, 0.60)
Bad	B	(0.20, 0.85, 0.80)
Very bad	VB	(0; 1; 1)

Table 2. Linguistic terms used in the assessment of dimensions and their associated SVNS

The evaluations of each dimension were also added using equation (2). Once the aggregations were obtained, the scoring function (3) was used to obtain a single evaluation value in assertive communication competencies, for each respondent. For this, the evaluative category was assigned according to the belonging of the individual score value to the intervals (for each category), which are shown in Table 3.

Scoring intervals	Evaluation	Linguistic term
[0 - 0.429)	VB	Very bad
[0.429-0.857)	B	Bad
[0.857-1.286)	RB	Regular tending to bad
[1,286 - 1,714)	R	Regular
[1,714-2,143)	G	Good
[2,143 - 2,571)	VG	Very good
[2,571-3]	E	Excellent

Table 3. Intervals for evaluation according to score function value

With the evaluation results in assertive communication competencies, the neutrosophic confidence interval of the population proportion was estimated for each level of assertive communication competency of the population of nurses in the city of Guayaquil.

4 Results

To meet the stated objective, a voluntary and anonymous survey was carried out in a group of nurses employed in the hospitals of the city of Guayaquil. To determine how many nurses to survey, it was estimated that there is a population of between 3,500 and 4,000 nurses in the city of Guayaquil. With this and through equation (11), the sample size was calculated with an estimated error of between. The result was a Neutrosophic Sample Size of $[4\%, 5\%][252,383]$

A sample composed of 294 randomly selected nurses was surveyed. The sample is statistically significant in terms of size (252 <294 <383). The results of the aggregate evaluation of each dimension are shown in Figure 1.

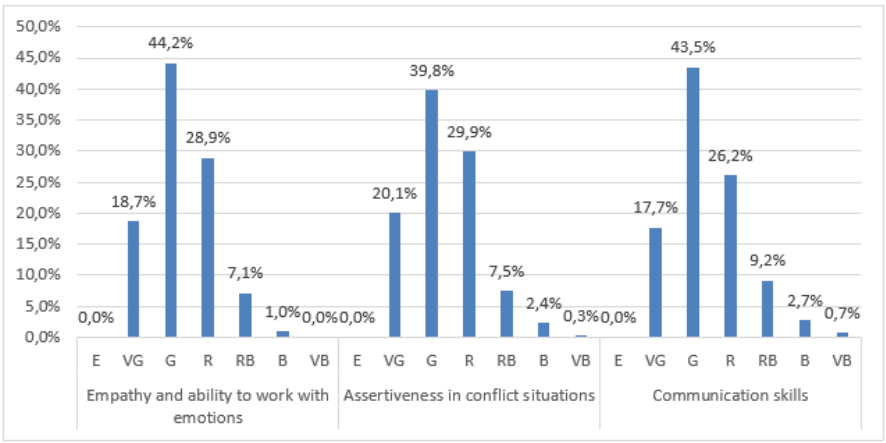

Figure 1. Percentage results of the evaluations of the three dimensions analyzed

These results show positive evaluations higher than 60% in the three dimensions. The remaining 40% of evaluations are predominantly Regular (R), with some from Regular tending to Bad (RB). Bad (B) and Very Bad (VB) evaluations are very scarce. The worst performing dimension was Assertiveness in conflict situations, although in reality, it is only slightly lower than the others.

The aggregation of the results in the three dimensions to obtain a global assessment of the assertive communication competency of each of the surveyed is sown in table 3

Surveyed	***Pw (A1...An)***	**Surveyed**	***Pw (A1...An)***	**Surveyed**	***Pw (A1...An)***
1	(0.44,0.6,0.5)	99	(0.6,0.35,0.4)	197	(0.5,0.5,0.5)
2	(0.34,0.71,0.58)	100	(0.54,0.44,0.46)	198	(0.66,0.3,0.34)
3	(0.66,0.3,0.34)	101	(0.57,0.39,0.43)	199	(0.75,0.2,0.25)
4	(0.07,0.95,0.93)	102	(0.57,0.39,0.43)	200	(0.57,0.39,0.43)
5	(0.75,0.2,0.25)	103	(0.57,0.39,0.43)	201	(0.6,0.35,0.4)
6	(0.47,0.55,0.5)	104	(0.57,0.39,0.43)	202	(0.57,0.39,0.43)
7	(0.54,0.44,0.46)	105	(0.6,0.35,0.4)	203	(0.6,0.35,0.4)
8	(0.75,0.2,0.25)	106	(0.68,0.26,0.32)	204	(0.47,0.55,0.5)
9	(0.68,0.26,0.32)	107	(0.8,0.15,0.2)	205	(0.34,0.71,0.58)
10	(0.75,0.2,0.25)	108	(0.6,0.35,0.4)	206	(0.68,0.26,0.32)
11	(0.68,0.26,0.32)	109	(0.68,0.26,0.32)	207	(0.6,0.35,0.4)
12	(0.6,0.35,0.4)	110	(0.2,0.85,0.8)	208	(0.57,0.39,0.43)
13	(0.34,0.71,0.58)	111	(0.51,0.48,0.46)	209	(0.75,0.2,0.25)
14	(0.47,0.55,0.5)	112	(0.54,0.44,0.46)	210	(0.75,0.2,0.25)
15	(0.66,0.3,0.34)	113	(0.44,0.6,0.5)	211	(0.5,0.5,0.5)
16	(0.54,0.44,0.46)	114	(0.6,0.35,0.4)	212	(0.75,0.2,0.25)
17	(0.6,0.35,0.4)	115	(0.6,0.35,0.4)	213	(0.51,0.48,0.46)
18	(0.75,0.2,0.25)	116	(0.68,0.26,0.32)	214	(0.6,0.35,0.4)
19	(0.5,0.5,0.5)	117	(0.5,0.5,0.5)	215	(0.6,0.35,0.4)
20	(0.51,0.48,0.46)	118	(0.68,0.26,0.32)	216	(0.68,0.26,0.32)
21	(0.57,0.39,0.43)	119	(0.57,0.39,0.43)	217	(0.57,0.39,0.43)
22	(0.75,0.2,0.25)	120	(0.68,0.26,0.32)	218	(0.57,0.39,0.43)
23	(0.57,0.39,0.43)	121	(0.57,0.39,0.43)	219	(0.75,0.2,0.25)
24	(0.54,0.44,0.46)	122	(0.57,0.39,0.43)	220	(0.4,0.65,0.5)
25	(0.57,0.39,0.43)	123	(0.6,0.35,0.4)	221	(0.6,0.35,0.4)
26	(0.8,0.15,0.2)	124	(0.5,0.5,0.5)	222	(0.8,0.15,0.2)
27	(0.68,0.26,0.32)	125	(0.68,0.26,0.32)	223	(0.44,0.6,0.5)
28	(0.38,0.65,0.58)	126	(0.5,0.5,0.5)	224	(0.54,0.44,0.46)
29	(0.27,0.78,0.68)	127	(0.57,0.39,0.43)	225	(0.6,0.35,0.4)
30	(0.68,0.26,0.32)	128	(0.47,0.55,0.5)	226	(0.6,0.35,0.4)
31	(0.8,0.15,0.2)	129	(0.68,0.26,0.32)	227	(0.6,0.35,0.4)
32	(0.5,0.5,0.5)	130	(0.54,0.44,0.46)	228	(0.8,0.15,0.2)
33	(0.66,0.3,0.34)	131	(0.6,0.35,0.4)	229	(0.68,0.26,0.32)
34	(0.8,0.15,0.2)	132	(0.54,0.44,0.46)	230	(0.6,0.35,0.4)
35	(0.66,0.3,0.34)	133	(0.5,0.5,0.5)	231	(0.68,0.26,0.32)
36	(0.68,0.26,0.32)	134	(0.6,0.35,0.4)	232	(0.75,0.2,0.25)
37	(0.8,0.15,0.2)	135	(0.6,0.35,0.4)	233	(0.5,0.5,0.5)
38	(0.5,0.5,0.5)	136	(0.5,0.5,0.5)	234	(0.6,0.35,0.4)
39	(0.75,0.2,0.25)	137	(0.8,0.15,0.2)	235	(0.68,0.26,0.32)
40	(0.75,0.2,0.25)	138	(0.54,0.43,0.43)	236	(0.57,0.39,0.43)
41	(0.57,0.39,0.43)	139	(0.68,0.26,0.32)	237	(0.5,0.5,0.5)
42	(0.6,0.35,0.4)	140	(0.68,0.26,0.32)	238	(0.75,0.2,0.25)
43	(0.54,0.44,0.46)	141	(0.54,0.44,0.46)	239	(0.5,0.5,0.5)
44	(0.75,0.2,0.25)	142	(0.68,0.26,0.32)	240	(0.6,0.35,0.4)

45	(0.8,0.15,0.2)	143	(0.5,0.5,0.5)	241	(0.6,0.35,0.4)
46	(0.5,0.5,0.5)	144	(0.5,0.5,0.5)	242	(0.6,0.35,0.4)
47	(0.47,0.55,0.5)	145	(0.44,0.6,0.5)	243	(0.6,0.35,0.4)
48	(0.6,0.35,0.4)	146	(0.34,0.71,0.58)	244	(0.47,0.55,0.5)
49	(0.6,0.35,0.4)	147	(0.75,0.2,0.25)	245	(0.47,0.55,0.5)
50	(0.75,0.2,0.25)	148	(0.6,0.35,0.4)	246	(0.66,0.3,0.34)
51	(0.68,0.26,0.32)	149	(0.6,0.35,0.4)	247	(0.6,0.35,0.4)
52	(0.54,0.44,0.46)	150	(0.5,0.5,0.5)	248	(0.5,0.5,0.5)
53	(0.27,0.78,0.68)	151	(0.75,0.2,0.25)	249	(0.5,0.5,0.5)
54	(0.68,0.26,0.32)	152	(0.5,0.5,0.5)	250	(0.6,0.35,0.4)
55	(0.57,0.39,0.43)	153	(0.4,0.65,0.5)	251	(0.6,0.35,0.4)
56	(0.8,0.15,0.2)	154	(0.8,0.15,0.2)	252	(0.6,0.35,0.4)
57	(0.75,0.2,0.25)	155	(0.66,0.3,0.34)	253	(0.5,0.5,0.5)
58	(0.47,0.55,0.5)	156	(0.6,0.35,0.4)	254	(0.75,0.2,0.25)
59	(0.68,0.26,0.32)	157	(0.57,0.39,0.43)	255	(0.54,0.44,0.46)
60	(0.6,0.35,0.4)	158	(0.8,0.15,0.2)	256	(0.6,0.35,0.4)
61	(0.54,0.43,0.43)	159	(0.5,0.5,0.5)	257	(0.54,0.44,0.46)
62	(0.66,0.3,0.34)	160	(0.57,0.39,0.43)	258	(0.68,0.26,0.32)
63	(0.34,0.71,0.58)	161	(0.54,0.44,0.46)	259	(0.57,0.39,0.43)
64	(0.54,0.44,0.46)	162	(0.8,0.15,0.2)	260	(0.5,0.5,0.5)
65	(0.57,0.39,0.43)	163	(0.6,0.35,0.4)	261	(0.34,0.71,0.58)
66	(0.68,0.26,0.32)	164	(0.75,0.2,0.25)	262	(0.5,0.5,0.5)
67	(0.8,0.15,0.2)	165	(0.57,0.39,0.43)	263	(0.75,0.2,0.25)
68	(0.54,0.44,0.46)	166	(0.8,0.15,0.2)	264	(0.47,0.55,0.5)
69	(0.5,0.5,0.5)	167	(0.5,0.5,0.5)	265	(0.6,0.35,0.4)
70	(0.68,0.26,0.32)	168	(0.6,0.35,0.4)	266	(0.68,0.26,0.32)
71	(0.54,0.44,0.46)	169	(0.66,0.3,0.34)	267	(0.68,0.26,0.32)
72	(0.44,0.6,0.5)	170	(0.51,0.48,0.46)	268	(0.6,0.35,0.4)
73	(0.54,0.44,0.46)	171	(0.6,0.35,0.4)	269	(0.47,0.55,0.5)
74	(0.5,0.5,0.5)	172	(0.5,0.5,0.5)	270	(0.47,0.55,0.5)
75	(0.68,0.26,0.32)	173	(0.68,0.26,0.32)	271	(0.5,0.5,0.5)
76	(0.68,0.26,0.32)	174	(0.8,0.15,0.2)	272	(0.68,0.26,0.32)
77	(0.54,0.44,0.46)	175	(0.54,0.44,0.46)	273	(0.47,0.55,0.5)
78	(0.54,0.44,0.46)	176	(0.47,0.55,0.5)	274	(0.4,0.65,0.5)
79	(0.6,0.35,0.4)	177	(0.6,0.35,0.4)	275	(0.54,0.44,0.46)
80	(0.47,0.55,0.5)	178	(0.75,0.2,0.25)	276	(0.8,0.15,0.2)
81	(0.44,0.6,0.5)	179	(0.6,0.35,0.4)	277	(0.47,0.55,0.5)
82	(0.8,0.15,0.2)	180	(0.54,0.44,0.46)	278	(0.68,0.26,0.32)
83	(0.54,0.44,0.46)	181	(0.5,0.5,0.5)	279	(0.68,0.26,0.32)
84	(0.75,0.2,0.25)	182	(0.4,0.65,0.5)	280	(0.8,0.15,0.2)
85	(0.57,0.39,0.43)	183	(0.6,0.35,0.4)	281	(0.6,0.35,0.4)
86	(0.75,0.2,0.25)	184	(0.47,0.55,0.5)	282	(0.6,0.35,0.4)
87	(0.57,0.39,0.43)	185	(0.54,0.44,0.46)	283	(0.47,0.55,0.5)
88	(0.68,0.26,0.32)	186	(0.57,0.39,0.43)	284	(0.5,0.5,0.5)
89	(0.57,0.39,0.43)	187	(0.6,0.35,0.4)	285	(0.66,0.3,0.34)
90	(0.57,0.39,0.43)	188	(0.5,0.5,0.5)	286	(0.57,0.39,0.43)
91	(0.8,0.15,0.2)	189	(0.47,0.55,0.5)	287	(0.54,0.44,0.46)
92	(0.5,0.5,0.5)	190	(0.57,0.39,0.43)	288	(0.54,0.44,0.46)
93	(0.6,0.35,0.4)	191	(0.6,0.35,0.4)	289	(0.6,0.35,0.4)
94	(0.47,0.55,0.5)	192	(0.8,0.15,0.2)	290	(0.6,0.35,0.4)
95	(0.57,0.39,0.43)	193	(0.38,0.65,0.58)	291	(0.8,0.15,0.2)

96	(0.75,0.2,0.25)	194	(0.75,0.2,0.25)	292	(0.29,0.75,0.63)
97	(0.57,0.39,0.43)	195	(0.34,0.71,0.58)	293	(0.46,0.53,0.54)
98	(0.54,0.44,0.46)	196	(0.61,0.37,0.37)	294	(0.6,0.35,0.4)
99	(0.6,0.35,0.4)	197	(0.5,0.5,0.5)	227	(0.6,0.35,0.4)
100	(0.54,0.44,0.46)	198	(0.66,0.3,0.34)	228	(0.8,0.15,0.2)
101	(0.57,0.39,0.43)	199	(0.75,0.2,0.25)	229	(0.68,0.26,0.32)
102	(0.57,0.39,0.43)	200	(0.57,0.39,0.43)	230	(0.6,0.35,0.4)
103	(0.57,0.39,0.43)	201	(0.6,0.35,0.4)	231	(0.68,0.26,0.32)
104	(0.57,0.39,0.43)	202	(0.57,0.39,0.43)	232	(0.75,0.2,0.25)
105	(0.6,0.35,0.4)	203	(0.6,0.35,0.4)	233	(0.5,0.5,0.5)
106	(0.68,0.26,0.32)	204	(0.47,0.55,0.5)	234	(0.6,0.35,0.4)
107	(0.8,0.15,0.2)	205	(0.34,0.71,0.58)	235	(0.68,0.26,0.32)
108	(0.6,0.35,0.4)	206	(0.68,0.26,0.32)	236	(0.57,0.39,0.43)
109	(0.68,0.26,0.32)	207	(0.6,0.35,0.4)	237	(0.5,0.5,0.5)
110	(0.2,0.85,0.8)	208	(0.57,0.39,0.43)	238	(0.75,0.2,0.25)
111	(0.51,0.48,0.46)	209	(0.75,0.2,0.25)	239	(0.5,0.5,0.5)
112	(0.54,0.44,0.46)	210	(0.75,0.2,0.25)	240	(0.6,0.35,0.4)
113	(0.44,0.6,0.5)	211	(0.5,0.5,0.5)	241	(0.6,0.35,0.4)
114	(0.6,0.35,0.4)	212	(0.75,0.2,0.25)	242	(0.6,0.35,0.4)
115	(0.6,0.35,0.4)	213	(0.51,0.48,0.46)	243	(0.6,0.35,0.4)
116	(0.68,0.26,0.32)	214	(0.6,0.35,0.4)	244	(0.47,0.55,0.5)
117	(0.5,0.5,0.5)	215	(0.6,0.35,0.4)	245	(0.47,0.55,0.5)
118	(0.68,0.26,0.32)	216	(0.68,0.26,0.32)	246	(0.66,0.3,0.34)
119	(0.57,0.39,0.43)	217	(0.57,0.39,0.43)	247	(0.6,0.35,0.4)
120	(0.68,0.26,0.32)	218	(0.57,0.39,0.43)	248	(0.5,0.5,0.5)
121	(0.57,0.39,0.43)	219	(0.75,0.2,0.25)	249	(0.5,0.5,0.5)
122	(0.57,0.39,0.43)	220	(0.4,0.65,0.5)	250	(0.6,0.35,0.4)
123	(0.6,0.35,0.4)	221	(0.6,0.35,0.4)	251	(0.6,0.35,0.4)
124	(0.5,0.5,0.5)	222	(0.8,0.15,0.2)	252	(0.6,0.35,0.4)
125	(0.68,0.26,0.32)	223	(0.44,0.6,0.5)	253	(0.5,0.5,0.5)
126	(0.5,0.5,0.5)	224	(0.54,0.44,0.46)	254	(0.75,0.2,0.25)
127	(0.57,0.39,0.43)	225	(0.6,0.35,0.4)	255	(0.54,0.44,0.46)
128	(0.47,0.55,0.5)	226	(0.6,0.35,0.4)	256	(0.6,0.35,0.4)
129	(0.68,0.26,0.32)	227	(0.6,0.35,0.4)	257	(0.54,0.44,0.46)
130	(0.54,0.44,0.46)	228	(0.8,0.15,0.2)	258	(0.68,0.26,0.32)
131	(0.6,0.35,0.4)	229	(0.68,0.26,0.32)	259	(0.57,0.39,0.43)
132	(0.54,0.44,0.46)	230	(0.6,0.35,0.4)	260	(0.5,0.5,0.5)
133	(0.5,0.5,0.5)	231	(0.68,0.26,0.32)	261	(0.34,0.71,0.58)
134	(0.6,0.35,0.4)	232	(0.75,0.2,0.25)	262	(0.5,0.5,0.5)
135	(0.6,0.35,0.4)	233	(0.5,0.5,0.5)	263	(0.75,0.2,0.25)
136	(0.5,0.5,0.5)	234	(0.6,0.35,0.4)	264	(0.47,0.55,0.5)
137	(0.8,0.15,0.2)	235	(0.68,0.26,0.32)	265	(0.6,0.35,0.4)
138	(0.54,0.43,0.43)	236	(0.57,0.39,0.43)	266	(0.68,0.26,0.32)
139	(0.68,0.26,0.32)	237	(0.5,0.5,0.5)	267	(0.68,0.26,0.32)
140	(0.68,0.26,0.32)	238	(0.75,0.2,0.25)	268	(0.6,0.35,0.4)
141	(0.54,0.44,0.46)	239	(0.5,0.5,0.5)	269	(0.47,0.55,0.5)
142	(0.68,0.26,0.32)	240	(0.6,0.35,0.4)	270	(0.47,0.55,0.5)
143	(0.5,0.5,0.5)	241	(0.6,0.35,0.4)	271	(0.5,0.5,0.5)
144	(0.5,0.5,0.5)	242	(0.6,0.35,0.4)	272	(0.68,0.26,0.32)
145	(0.44,0.6,0.5)	243	(0.6,0.35,0.4)	273	(0.47,0.55,0.5)
146	(0.34,0.71,0.58)	244	(0.47,0.55,0.5)	274	(0.4,0.65,0.5)

147	(0.75,0.2,0.25)	245	(0.47,0.55,0.5)	275	(0.54,0.44,0.46)
148	(0.6,0.35,0.4)	246	(0.66,0.3,0.34)	276	(0.8,0.15,0.2)
149	(0.6,0.35,0.4)	247	(0.6,0.35,0.4)	277	(0.47,0.55,0.5)
150	(0.5,0.5,0.5)	248	(0.5,0.5,0.5)	278	(0.68,0.26,0.32)
151	(0.75,0.2,0.25)	249	(0.5,0.5,0.5)	279	(0.68,0.26,0.32)
152	(0.5,0.5,0.5)	250	(0.6,0.35,0.4)	280	(0.8,0.15,0.2)
153	(0.4,0.65,0.5)	251	(0.6,0.35,0.4)	281	(0.6,0.35,0.4)
154	(0.8,0.15,0.2)	252	(0.6,0.35,0.4)	282	(0.6,0.35,0.4)
155	(0.66,0.3,0.34)	253	(0.5,0.5,0.5)	283	(0.47,0.55,0.5)
156	(0.6,0.35,0.4)	254	(0.75,0.2,0.25)	284	(0.5,0.5,0.5)
157	(0.57,0.39,0.43)	255	(0.54,0.44,0.46)	285	(0.66,0.3,0.34)
158	(0.8,0.15,0.2)	256	(0.6,0.35,0.4)	286	(0.57,0.39,0.43)
159	(0.5,0.5,0.5)	257	(0.54,0.44,0.46)	287	(0.54,0.44,0.46)
160	(0.57,0.39,0.43)	258	(0.68,0.26,0.32)	288	(0.54,0.44,0.46)
161	(0.54,0.44,0.46)	259	(0.57,0.39,0.43)	289	(0.6,0.35,0.4)
162	(0.8,0.15,0.2)	260	(0.5,0.5,0.5)	290	(0.6,0.35,0.4)
163	(0.6,0.35,0.4)	261	(0.34,0.71,0.58)	291	(0.8,0.15,0.2)
164	(0.75,0.2,0.25)	262	(0.5,0.5,0.5)	292	(0.29,0.75,0.63)
165	(0.57,0.39,0.43)	263	(0.75,0.2,0.25)	293	(0.46,0.53,0.54)
166	(0.8,0.15,0.2)	264	(0.47,0.55,0.5)	294	(0.6,0.35,0.4)

Table 3. Aggregate assessment of assertive communication competency of the surveyed nurses

The assessment of assertive communication competency, obtained through the calculation of the scoring function and its localization in the intervals defined in table 3, is shown in figure 2.

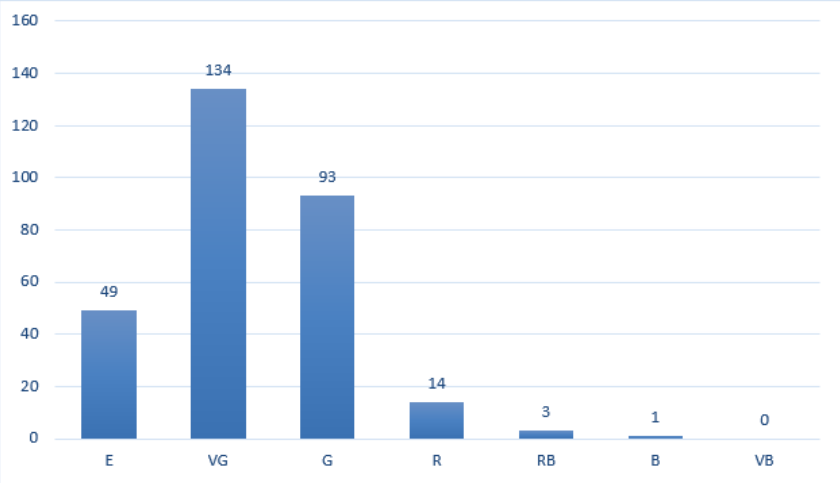

Figure 2. Absolute frequency of assertive communication competency assessments

The modal assessment is Very Good (VG), with an absolute frequency of 134 (for a relative frequency of 45.6%), followed by Good (G) category with (31.6%). It is worth remarking that only 18 surveyed have a category lower than Regular, which indicates that, in the selected simple, nursing specialists have an adequate assertiveness.

The results of the estimation of neutrosophic population proportion for a 99% of reliability of the assertive communication competency of nurses in Guayaquil are shown in table 4.

Linguistic term	**Assessment**	**Confidence interval**
Excellent	E	[12.4%, 20.9%]
Very good	VG	[39.9%, 51.3%]
Good	G	[26.3%, 36.9%]

Regular	R	[2.3%, 7.2%]

Table 4. Results of the estimation of the neutrosophic population proportion.

For the lower categories, the condition $min\{np\} \geq 5$ and $min\{n \cdot (1-p)\} \geq 5$ is not met, hence its population estimation could not be done, although evidence place it close to the zero value. It is then estimated that, at a population level, between 12.4% and 20.9% of nurses in Guayaquil reach outstanding assertive communication competency levels, while about half of them (between 49 and 51%) have an assessment that can be considered in the category of Very Good.

Conclusions

The development of assertive communication competencies allows nursing professionals to keep good relationships with their therapeutic team and the patient and avoid professional burnout. Through the neutrosophic study of a significant sample of nurses in Guayaquil, we obtained that assertive communication competencies of nurses in Guayaquil are in general Very Good as for empathy and the ability to work with emotions, assertiveness in conflict situations, and communication skills. The use of neutrosophic statistics and the linguistic terms associated with SVNS allowed a wider treatment of the assessments and the neutrosophic population proportion estimation with a 99% reliability.

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