



MADM for Assessment the Nurses Knowledge and their Attitudes During Covid-19 Spread in Mosul City in the Perspective of Neutrosophic Environment

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Abstract

Coronavirus remains an important public health issue both nationally and globally, so all healthcare professionals including nurses should have a good knowledge and attitudes for educating their patients about Coronavirus and provide appropriate referral and support mechanisms to minimize the complication of disease [1]. COVID-19 is an emerging, rapidly changing global health challenge affecting all sectors [2, 3]. The Health Care Workers (i.e. HCWs) are not only at the forefront of the fight against this highly infectious disease but are also directly or indirectly affected by it and the likelihood of acquiring this disease is higher among HCWs compared to the general population [4]. Therefore, it is importance that HCWs across the world have adequate knowledge and good attitudes about all aspects of the disease from clinical manifestation, diagnosis, proposed treatment and established prevention strategies.

In this manuscript, a descriptive design study was conducted from 1st April to June 2021. The study samples consisting of 90 nurses were purposively selected in three hospitals (Al-Khansa Teaching Hospital, Ibn Sina Teaching Hospital, and Telafer General Hospital) in Mosul city

The objectives of this study are to assess the knowledge and attitudes of nurses about the Covid19 using the multi attribute decision making technique where the data have been adapted and reconstructed to be as triangular single-valued neutrosophic numbers (TSVNN) and tackled these (TSVNN) into the neutrosophic structured element (NSE).

It is well known that the neutrosophic theory has flexible tools to analyze data utilized in dozens of fields of science such as but not limited to medicine, engineering, economics, healthcare, physics...etc. In this manuscript, the authors were very felicitous to choose an uncertain mathematical environment named neutrosophic theory to use it as a strong method in decision making technique to measure the performance of the nurses and their attitude in three Iraqi hospitals during a specific period of time where Covid19 has spread and was in its peak.

The decision-making with multi-attribute criteria containing truth membership, indeterminate membership, and falsity membership is regarded as the core of the neutrosophic decisions. The

neutrosophic theory used to handle uncertain, vague, incomplete, and inconsistent data or information which already exist in our daily life.

Keywords: Triangular Single-Valued Neutrosophic Number (TSVNN); Neutrosophic Structured Element; Knowledge; Attitude; Attribute; Covid-19; Nurses’ attitude; Mosul City; Health Care Workers (HCWs).

1. Introduction

A descriptive design study was conducted from 1st April to June 2021. The study samples consisting of 90 nurses were purposively selected in three hospitals (Al-Khansa Teaching Hospital, Ibn Sina Teaching Hospital, and Telafer General Hospital) in Mosul city in Iraq, using a structured questionnaire, it was done using interviews and purposive sampling technique.

The modern mathematical procedure has been used to make a fair decision about the question: which one of the nurses’ staff that exists in the above three Iraqi hospitals will be the best in their attitude serving the patients of corona pandemic? In this manuscript, the neutrosophic structured element presented by S. A. Edalatpanah [5] was the best procedure to handle the data, therefore, the following concepts and definitions are the mathematical tools that used in this paper:

1.1 Definition:

Consider the single-valued neutrosophic set (SVNS) of $A = \{x, T_{A^N}(x), I_{A^N}(x), F_{A^N}(x) \mid x \in X\}$, where $T_{A^N} = (a_1, a_2, a_3), I_{A^N}(x) = (b_1, b_2, b_3), and F_{A^N}(x) = (c_1, c_2, c_3)$, mathematically and for $T_{A^N}(x), I_{A^N}(x), F_{A^N}(x)$, it is easy to obtain three monotone bounded functions $f, g, h: [-1,1] \rightarrow [0,1]$. Such that $T_{A^N}(x) = f_A(x), I_{A^N}(x) = g_A(x), F_{A^N}(x) = h_A(x)$.

We call that

$$f_A(x) = \begin{cases} (a_2 - a_1)x + a_2; & -1 \leq x \leq 0, \\ (a_3 - a_2)x + a_2; & 0 \leq x \leq 1, \\ 0; & \text{others,} \end{cases}$$

$$g_A(x) = \begin{cases} (b_2 - b_1)x + b_2; & -1 \leq x \leq 0, \\ (b_3 - b_2)x + b_2; & 0 \leq x \leq 1, \\ 0; & \text{others,} \end{cases}$$

$$h_A(x) = \begin{cases} (a_2 - a_1)x + a_2; & -1 \leq x \leq 0, \\ (a_3 - a_2)x + a_2; & 0 \leq x \leq 1, \\ 0; & \text{others,} \end{cases}$$

are the neutrosophic structured elements (NSEs). Also, $\langle f_A(x), g_A(x), h_A(x) \rangle$ is the neutrosophic structured elements number (NSEN), and $A = \{x, f_A(x), g_A(x), h_A(x) \mid x \in X\}$ is the neutrosophic structured elements set (NSES).

1.2 Example:

Consider two TSVNNs as follow:

$$A = \langle (0.5, 0.6, 0.7), (0.1, 0.2, 0.3), (0.3, 0.4, 0.5) \rangle,$$

$$B = \langle (0.4, 0.5, 0.6), (0.2, 0.3, 0.4), (0.5, 0.6, 0.7) \rangle,$$

Converts the above triangular single-valued neutrosophic numbers into neutrosophic structured element numbers, fro $-1 \leq x \leq 1$, as follow:

$$A = \langle (0.1x + 0.6), (0.1x + 0.2), (0.1x + 0.4) \rangle$$

$$B = \langle (0.1x + 0.5), (0.1x + 0.3), (0.1x + 0.6) \rangle.$$

1.3 Definition

Let $A = \langle f_A(x), g_A(x), h_A(x) \rangle$, be an NSE number, then we call

$$S(A) = \frac{1}{9} \int_{-1}^1 E(x)(2 + f_A(x) - g_A(x) - h_A(x)) \, dx$$

$$= \frac{1}{9} \int_{-1}^0 (1 - x)(2 + f_A(x) - g_A(x) - h_A(x)) \, dx + \frac{1}{9} \int_0^1 (1 + x)(2 + f_A(x) - g_A(x) - h_A(x)) \, dx$$

And

$$AC(A) = \frac{1}{9} \int_{-1}^1 E(x)(2 + f_A(x) - g_A(x) + h_A(x)) \, dx$$

$$= \frac{1}{9} \int_{-1}^0 (1 - x)(2 + f_A(x) - g_A(x) + h_A(x)) \, dx + \frac{1}{9} \int_0^1 (1 + x)(2 + f_A(x) - g_A(x) + h_A(x)) \, dx$$

As the score and the accuracy functions of A , respectively.

1.4 Example:

Let $F = \langle (0.1x + 0.6), (0.1x + 0.2), (0.1x + 0.4) \rangle$ be an neutrosophic structured element number, then,

$$S(F) = \frac{1}{9} \left[\left(\int_{-1}^0 (1 - x) \left(-\frac{x}{10} + \frac{50}{25} \right) dx \right) + \left(\int_0^1 (1 + x) \left(-\frac{x}{10} + \frac{50}{25} \right) dx \right) \right] = \frac{50}{75}$$

$$AC(F) = \frac{1}{9} \left[\left(\int_{-1}^0 (1 - x) \left(\frac{x}{10} + \frac{70}{25} \right) dx \right) + \left(\int_0^1 (1 + x) \left(\frac{x}{10} + \frac{70}{25} \right) dx \right) \right] = \frac{70}{75}$$

1.5 Definition

Let P and Q be two NSE numbers, then

If $S(P) < S(Q)$, then P is smaller than Q , denoted by $P < Q$.

If $S(P) = S(Q)$, then $P = Q$.

If $AC(P) < AC(Q)$, then P is smaller than Q , denoted by $P < Q$.

If $AC(P) = AC(Q)$, then P and Q are the same, denoted by $P = Q$.

1.6 Example

Consider the following two NSE numbers $A = \langle (0.1x + 0.6), (0.1x + 0.2), (0.1x + 0.4) \rangle$, $B = \langle (0.1x + 0.5), (0.1x + 0.3), (0.1x + 0.6) \rangle$. Since $S(A) = \frac{50}{75}$ and $S(B) = \frac{40}{75}$, then B is smaller than A , and therefore $A > B$.

1.7 Theorem

Let $A_j = \langle f_{A_j}(x), g_{A_j}(x), h_{A_j}(x) \rangle$ ($j = 1, 2, \dots, n$) be NSE set. The aggregated result for the NSE weighted arithmetic average operator is as follows:

$$F_\omega(A_1, \dots, A_n) = \langle 1 - \prod_{j=1}^n (1 - f_{A_j}(x))^{\omega_j}, \prod_{i=1}^n (g_{A_j}(x))^{\omega_j}, \prod_{i=1}^n (h_{A_j}(x))^{\omega_j} \rangle$$

Where $W = (\omega_1, \omega_2, \dots, \omega_n)$ is the weight vector of A_j , $\omega_j \in [0, 1]$ and $\sum_{j=1}^n \omega_j = 1$.

1.8 Algorithm

Step 1: Convert the TSVNNs into the related NSE numbers.

Step 2: Calculate the weighted arithmetic average values $F_\omega(A_1, \dots, A_n)$.

Step 3: Calculate the score degree of all alternatives.

Step 4: Give the ranking order of the alternatives from the definition (1.6), and choose the best alternative(s).

Step 5: End.

1.9 Results Analysis Traditionally

The tables of information illustrates that the majority of nurses (i.e. fifty-five percentage) were from the age group (31-40) years, also the majority of nurses (i.e. sixty-two percent) were males more than half number, concerning the level of education majority of nurses (i.e. forty percent) were graduate from Institute, majority of nurses (i.e. fifty-three percent) they were had contracted COVID-19, majority of nurses (i.e. forty-two percent) they were had experience more than eleven years.

1.10 Data Analysis in Two Ways Traditionally and Neutrosophically

After a deep insight on the concluded results of the upcoming sections of this article, we will conclude from this study that the nurses have relatively good knowledge, but had a poor attitude about Covid-19.

From the neutrosophic theory perspective, it is important to conclude that the multi-attribute decision making using neutrosophic structured elements that presented in the sub-sections (1.1 to 1.8) was very powerful technique to compare the performance of the nurses' staff in three Iraqi hospitals using questionnaire that contains ten statements determine ten attitudes of nurses towards COVID-19 that have been summarized in table 4 as:

- 1- Put facemask on known or suspected patients.
- 2- Place known or suspected patients in adequately ventilated single rooms.
- 3- All health staff members wear protective clothing.
- 4- Avoid moving and transporting patients out of their area unless necessary.
- 5- Frequently clean hands by using alcohol-based hand rub or soap and water.
- 6- Routinely clean and disinfect surfaces in contact with known or suspected patients.
- 7- Clean and disinfect environmental surfaces.

- 8- Practice social distancing.
- 9- In a hospital do you prefer having more attendants with the patient?
- 10- Do You want to continue working with COVID-19 patients?

This paper contains two directions in analyzing data, the traditional classical analysis with their results recorded in tables (1-4), their conclusions, and recommendations are mentioned too. The second direction of analysis was the neutrosophic technique focused on a table (4) by using a decision matrix of dimension 3×10 , (i.e. three alternatives/ hospitals with ten attitudes), and using MATLAB version R2020b (9. 9. 0. 1467703) to execute the required score function and necessary integrations.

2. Manuscript's Roadmap:

The newest member of the coronavirus family (2019-nCoV) has been recently identified as resulting in acute and severe respiratory syndrome in humans [6]. The first infected patient who had clinical manifestations such as fever, cough, and dyspnea [7] was reported on 12 December 2019 in Wuhan, China [6]. Since then, 2019-nCoV has spread rapidly to other countries via different ways such as airline travelling and now, COVID-19 is the world's pandemic problem [8]. Low pathogenicity and high transmissibility [9] are the two unique features of this new virus that distinguish it from other members of the coronavirus family such as SARS-COV and MERS-COV; this subsequently makes it difficult to control so that after passing more than three months of identifying the first infected human, the rate of infection and mortality is still high and COVID-19 has become a great public health concern in the world. No antiviral agents have been recommended so far [10] and prevention is the best way to limit the infection.

It seems that the current widespread outbreak has been partly associated with a delay in diagnosis and poor infection control procedures [11]. As transmission within hospitals and protection of healthcare workers are important steps in the epidemic, understanding or having enough information regarding sources, clinical manifestations, transmission routes, and prevention ways among healthcare workers can play roles for this gal assessment. Since nurses are in close contact with infected people, they are the main part of the infection transmission chain and their knowledge of 2019-nCoV prevention and protection procedures can help prevent the transmission chain. Iraq is one of the most epidemic countries for COVID-19 and there is no information regarding the awareness and attitude of Iraqi nurses about this infectious disease.

Coronavirus disease 2019 (COVID-19) is defined as an illness caused by a novel coronavirus, now called Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2; formerly called 2019-nCoV). COVID-19 is an emerging respiratory infection that was first discovered in December 2019, in Wuhan city, Hubei Province, China [12]. SARS-CoV-2 belongs to the larger family of ribonucleic acid (RNA) viruses, leading to infections, from the common cold to more serious diseases, such as Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV) [13]. The

main symptoms of COVID-19 have been identified as fever, dry cough, fatigue, myalgia, shortness of breath, and dyspnea [14, 15].

COVID-19 is characterized by rapid transmission and can occur by close contact with an infected person [16,17]. The details of the disease are evolving. As such, this may not be the only way the transmission is occurring. COVID-19 has spread widely and rapidly, from Wuhan city to other parts of the world, threatening the lives of many people [18]. By the end of January 2020, the World Health Organization (WHO) announced a public health emergency of international concern and called for the collaborative effort of all countries, to prevent its rapid spread. Later, the WHO declared COVID-19 a “global pandemic” [19].

2.1 Aim:

Traditional aim:

Assessment of the Knowledge, and Attitudes of Covid19 among Nurses in Mosul City / Iraq.

Smart Aim:

By focusing on the table (4) and trying to use multi-attribute decision-making in neutrosophic environment to choose the best hospital (i.e. alternative) for the hospitalization.

2.2 Objectives:

The objectives of the study are to assess the knowledge and attitudes of nurses in both ways, by traditional mathematical tools, and by new powerful algorithm used multi-attribute decision making in neutrosophic environment to choose the most appropriate alternative between three hospitals in Mosul province.

2.3 Hypothesis:

The first hypothesis is that nurses do not have sufficient knowledge and attitudes related to Covid19.

The second hypothesis is that data collection, and analysis traditionally leads to the loss of many facts that should be highlighted using modern mathematical methods.

2.4 Methodology:

The methodology of this study is tracing the following directions:

2.4.1 Research Design and Study Setting:

This descriptive design study was conducted from 1st April to June 2021. The study samples consisting of 90 nurses who were purposively selected from three hospitals (Al-Khansa Teaching Hospital, Ibn Sina Teaching Hospital, and Telafer General Hospital) in Mosul city.

2.4.2 Sample Size:

The sample of the study consisted of 90 nurses who were purposively chosen from three hospitals (Al-Khansa Teaching Hospital, Ibn Sina Teaching Hospital, and Telafer General Hospital) in Mosul city.

2.4.3 The Selection Criteria of The samples:

All nurses who work in the three hospitals (Al-Khansa Teaching Hospital, Ibn Sina Teaching Hospital, and Telafer General Hospital).

2.4.4 Exclusion Criteria:

Nurses who were refusing to participate in the study

2.4.5 The Questionnaire is of Three Parts:

Part A -Demographic variables such as (Age, Gender, Marital status, Infected with covid19, Level of education, and Years of experience).

Part B -Knowledge regarding covid19, the knowledge assessment consists of fifteen questions related to the definition of coronavirus, symptoms, and signs of coronavirus, methods to prevent the transmission of coronavirus, risk factors for coronavirus, and treatment of coronavirus.

Part C -Attitudes concerning covid19, the attitudes assessment consists of ten questions/ statements related to protective measures against coronavirus, the position of patients with coronavirus, the practice of social distancing, and the opinion of nurses for working with coronavirus patients.

Each of the above parts (A, B, C) is partitioned into three hospitals (Al-Khansa H., Ibn Sina H., Telafer H.). It is worth mentioning that part C (i.e. table 4) divided the responses of the nurses concerning the ten attitudes into (strongly agree, agree, no idea, disagree, and strongly disagree) these scopes gave the authors the ability to use the triangular single valued neutrosophic numbers and neutrosophic structured elements.

2.4.6 Traditional Scoring Key for Knowledge and Attitude

Percentage interpretation for knowledge

1 to 5 -<50% - Poor knowledge

6 to 10 -50-77% - Fair knowledge

11 to 15 -77-100% - Good knowledge

The validity of the tool was obtained from the experts, and recommendations given by the experts were included and complement the tool before data collection.

2.4.7 Smart Scoring Function for Attitude

Note that the smart scoring function has been mentioned in subsections (1.1 to 1.8), and it will be applied in the forthcoming sections.

2.4.8 Procedure of Data Collection:

Before the actual collection of data, formal administrative approval was obtained to conduct the study from the concerned authorities in the three hospitals (Al-Khansa Teaching Hospital, Ibn Sina Teaching Hospital, and Telafer General Hospital) / in Mosul / Iraq. The period of the data collection was from 1st April to June 2021. Before collecting the data, permission and agreement were taken

from the participants, and the time spent to complete each form was approximately 15-20 minutes. A pilot study was done on 20 nurses, using the same setting and questionnaire to evaluate the achievable of the study that was reexamined to remove doubts and clear up the questions. Its content validity was evaluated by experts.

2.4.9 Traditional Data Analysis:

Data gathered from 90 nurses were arranged, and tabulated in the master sheet. Demographic variables such as (Age, Gender, Marital status, Infected with covid19, Level of education, Years of experience), knowledge and attitude questions. The data were analyzed descriptively using SPSS software version 21, like frequency, and percentage.

2.4.10 Traditional Results:

Table (1) refers to the Socio-demographic characteristics the majority of nurses (55%) were from the age group (31-40) years, and also shows that the rate of males to females represents (62 %:37%) of the samples respectively, and the high percentage of nurses (80%) are married, about concerning the level of education, the majority of the nurses (40%) were graduate from Institute while regarding an infected the covid19 the majority of nurses (53%) are infected the covid19. Finally, about the years of experience, the majority of nurses (42%) had an experience of more than eleven years.

Table (1) The Socio-demographic of the nurses:

Variables	Range or Status	percentage	No. of nurses	Khansa H.	Ibn- Sina H.	Telafer H.
Age group	20 - 30 year	27.77	25	10	8	7
	31- 40 year	55.55	50	15	15	20
	41 years & over	16.66	15	5	7	3
Gender	Male	62.22	56	20	18	18
	Female	37.77	34	10	12	12
Marital status	Single	20	18	4	6	8
	Married	80	72	26	24	22
were you ever infected from COVID-19 ?	Yes	53.33	48	15	16	17
	No	46.66	42	15	14	13

Level of education	High school	22.22	20	5	6	9
	Nursing diploma	40,11	37	8	8	7
	Bachelor	27.77	25	12	13	14
	M.SE	8.88	8	5	3	0
	PhD	0	0	0	0	0
Years of experience	1-5 years	8.88	8	3	3	2
	6-10 years	15.55	14	5	4	5
	11-15	42.22	38	14	13	11
	16 Years &over	33.33	30	8	10	12

Table 2, clarified that (52%) of the samples had good knowledge, while only one-a third of the samples (i.e. 31%) recorded good attitudes.

Table 2: percentage of the knowledge and attitudes of the participants

	Participants (%) (n=90)		
	Poor	Fair	Good
Knowledge	20 (22%)	23 (25%)	47 (52%)
Attitude	14 (15%)	48 (53%)	28 (31%)

Nurses' knowledge of covid19 is presented in Table (3). Most of the nurses' samples were have good knowledge of the Coronavirus that Corona is a viral infection and the main clinical symptoms of Corona are fever, cough, sore throat, shortness of breath, muscle pain/fatigue, loss of sense of smell and taste and also the way to prevent infection of Coronavirus. Also, avoiding going to crowded places such as train stations and avoiding using public transportation, represent (100%), as well as, the knowledge of symptoms and signs of Coronavirus are loss of appetite, nausea, cramping, and diarrhea representing (73.33%,76.66%) respectively. While regarding the knowledge about the statement "Corona disease can be dangerous", Coronavirus is transmitted by direct contact and through respiratory droplets from an injured person, and isolation and treating infected people with the Coronavirus is one of the effective ways to limit the spread Virus which represent (96%). The question related to washing hands with soap and water and using masks prevents disease

transmission, and also that the elderly and patients suffering from chronic diseases are more likely to suffer from severe infection and death is represented (83.33%). But knowledge about People who have been in touch with a person infected with the Coronavirus should be put in suitable place quarantine. In general, under observation for 14 days represent (76.66%). While the percentage of knowing about Antibiotics used to treat Corona is (51%). Finally, the knowledge regarding the fact that Children and young people do not need to take preventive measures to infection with Coronavirus represents (20%).

Table 3: Knowledge of nurses about covid19

Questions about aid	Yes					No				
	Total number of responding nurses out of 90	%	Telafe r H.	Ibn-Sina H.	Khanas H.	Total number of responding nurses out of 90	%	Telaf er H.	Ibn-Sina H.	Khanas H.
Corona is a viral infection	90	100	30	30	30	0	0	0	0	0
The main clinical symptoms of coronavirus are fever, cough, sore throat, shortness of breath, and muscle pain / fatigue	90	100	30	30	30	0	0	0	0	0
Symptoms and signs of Coronavirus include loss of appetite, nausea, and cramping	66	73.33	26	20	20	24	26.66	4	10	10
One of the symptoms and signs of Coronavirus is a loss of the sense of smell or taste	90	100	30	30	30	0	0	0	0	0
One of the symptoms and signs of Corona virus is diarrhea	69	76.66	21	25	23	21	23.33	9	5	7
Antibiotics are used to treat corona	46	51.11	15	16	15	44	48.88	15	14	15

Washing hands with soap and water and using masks prevents transmission of the disease	75	83. 33	24	25	26	15		6	5	4
Health workers are more susceptible to disease	72	80	25	21	26	18	20	5	9	4
Corona disease can be dangerous	87	96. 66	28	30	29	3	3. 33	2	0	1
The elderly and patients with chronic diseases are at greater risk of severe infection and death	75	83. 33	23	25	27	15	16 .6 6	7	5	3
Coronavirus is transmitted by direct contact and through respiratory droplets from injured person.	87	96. 66	30	29	28	3	3. 33	0	1	2
People who have been in contact with a person infected with the Coronavirus should be put them in suitable place quarantine. In general, under observation for 14 days.	69	76. 66	23	24	22	21	23 .3 3	7	6	8
To prevent infection with the Coronavirus, individuals should avoid going to crowded places such as train stations and use public transportation.	90	100	30	30	30	0	0	0	0	0
Children and young people do not need to take the preventive measures in order to infection with Coronavirus	18	20	4	5	9	72	80	26	25	21

The isolation and treating infected people with the Coronavirus, effective ways to limit the spread Virus.	86	96.55	28	29	29	4	4.44	2	1	1
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Table (4) revealed the key role in understanding nurses' attitudes toward COVID-19, it is clearly table (4) has been partitioned into five copies depending on the nurses' opinions which are: (strongly agree, agree, No- idea, disagree, strongly disagree), and their answers on the ten questions.

By using traditionally analysis, the reader will find most nurses had good attitudes about putting facemasks on known or suspected patients represent (88%), and only (8%) of nurses agree with the place known or suspected patients in adequately ventilated single rooms, and (44%) didn't have any idea about all health staff members wear protective clothing, But only (21%) said they avoid moving and transporting patients out of their area unless necessary, and (66%) they said should frequently clean hands by using alcohol-based hand rub or soap and water, But only (21%) said they routinely clean and disinfect surfaces in contact with known or suspected patients, About (65%) of nurses agreed on the cleaning and disinfecting environmental surfaces, But only (18%) of them didn't agree with practice social distancing, and (44%) agree with prefer having more attendants with the patient in the hospital, Finally, Only (3%) they said want to continue taking care of corona patients.

Table 4: Attitudes of Nurses towards COVID-19: The Strongly Agree Part of the Table

Attitudes questions of COVID-19	Strongly agree		Khansa H.	Ibn-Sina H.	Telafer H.
	Total number of responding nurses out of 90	%			
Put facemask on known or suspected patients	70	77	35	20	15
Place known or suspected patients in adequately ventilated single rooms	2	2	1	1	0
All health staff members wear protective clothing	8	8	3	4	1
Avoid moving and transporting patients out of their area unless necessary	6	6	2	2	2
Frequently clean hands by using alcohol-based hand rub or soap and water	14	15	4	7	3
Routinely clean and disinfect surfaces in contact with known or suspected patients	4	4	2	1	1
Clean and disinfect environmental surfaces	16	17	6	5	5
Practice social distancing	18	20	6	6	6
In a hospital do you prefer having more attendants with the patient?	30	33	15	10	5

You want to continue work with COVID 19 patients?	1	1	0	1	0
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Table 4: Attitudes of Nurses towards COVID-19: The Agree Part of the Table

Attitudes questions of COVID-19	Agree		Khansa H.	Ibn-Sina H.	Telafer H.
	Total number of responding nurses out of 90	%			
Put facemask on known or suspected patients	10	11	3	4	3
Place known or suspected patients in adequately ventilated single rooms	6	6	3	2	1
All health staff members wear protective clothing	18	20	10	3	5
Avoid moving and transporting patients out of their area unless necessary	14	15	3	4	7
Frequently clean hands by using alcohol-based hand rub or soap and water	46	51	10	20	16
Routinely clean and disinfect surfaces in contact with known or suspected patients	16	17	6	5	5
Clean and disinfect environmental surfaces	48	53	18	14	16
Practice social distancing	30	33	9	11	10
In a hospital do you prefer having more attendants with the patient?	10	11	4	2	4
You want to continue work with COVID 19 patients?	2	2	1	0	1

Table 4: Attitudes of Nurses towards COVID-19: The No-idea Part of the Table

Attitudes questions of COVID-19	No-idea				
	Total number of responding nurses out of 90	%	Khansa H.	Ibn-Sina H.	Telafer H.
Put facemask on known or suspected patients	10	11	3	3	4
Place known or suspected patients in adequately ventilated single rooms	24	26	7	9	8
All health staff members wear protective clothing	36	40	9	16	11
Avoid moving and transporting patients out of their area unless necessary	40	44	18	6	16

Frequently clean hands by using alcohol-based hand rub or soap and water	25	27	6	14	5
Routinely clean and disinfect surfaces in contact with known or suspected patients	24	26	13	6	5
Clean and disinfect environmental surfaces	16	17	4	6	6
Practice social distancing	25	27	6	5	14
In a hospital do you prefer having more attendants with the patient?	40	44	9	19	12
You want to continue work with COVID 19 patients?	12	13	5	3	4

Table 4: Attitudes of Nurses towards COVID-19: The Disagree Part of the Table

Attitudes questions of COVID-19	Disagree				
	Total number of responding nurses out of 90	%	Khansa H.	Ibn-Sina H.	Telafer H.
Put facemask on known or suspected patients	0	0	0	0	0
Place known or suspected patients in adequately ventilated single rooms	50	55	19	16	15
All health staff members wear protective clothing	14	15	4	4	6
Avoid moving and transporting patients out of their area unless necessary	20	22	7	6	7
Frequently clean hands by using alcohol-based hand rub or soap and water	3	3	1	1	1
Routinely clean and disinfect surfaces in contact with known or suspected patients	30	33	11	9	10
Clean and disinfect environmental surfaces	4	4	1	2	1
Practice social distancing	10	11	2	4	4
In a hospital do you prefer having more attendants with the patient?	6	6	3	2	1
You want to continue work with COVID 19 patients?	49	54	15	19	15

Table 4: Attitudes of Nurses towards COVID-19: The Strongly Disagree Part of the Table

Attitudes questions of COVID-19	Strongly Disagree				
	Total number of responding	%	Khansa H.	Ibn-Sina H.	Telafer H.

	nurses out of 90				
Put facemask on known or suspected patients	0	0	0	0	0
Place known or suspected patients in adequately ventilated single rooms	8	8	2	3	3
All health staff members wear protective clothing	10	11	4	2	4
Avoid moving and transporting patients out of their area unless necessary	10	11	3	3	4
Frequently clean hands by using alcohol-based hand rub or soap and water	2	2	0	1	1
Routinely clean and disinfect surfaces in contact with known or suspected patients	16	17	7	4	5
Clean and disinfect environmental surfaces	6	6	2	2	2
Practice social distancing	7	7	2	3	2
In a hospital do you prefer having more attendants with the patient?	4	4	1	1	2
You want to continue work with COVID 19 patients?	26	28	9	9	8

3. Smart Results of Table 4 to Assess the Nurses' Attitude Using Multi Attribute Decision-Making in Neutrosophic Environment.

Neutrosophic logic was first innovated by the American Scientist Florentin Smarandache, he put the triple (truth membership function, indeterminate membership function, and falsity membership function) regarded as the big revolution in mathematics. This new vision for problems, ideas, and concepts is more general than the uncertainty fuzzy logic presented by L. Zadeh in 1965 [20], also it is a generalization of the uncertainty intuitionistic fuzzy logic presented by K. Atanasove in 1982 [21] by adding a third part of data which is inconsistent or incompleteness or indeterminate since 1995 till now thousands of articles, books, applications have been issued, demonstrating that the dominant field of knowledge is the neutrosophic knowledge. Huda E. Khalid with Florentin Smarandache [22] have established Neutrosophic International Association (NSIA) and put the internal instructions for this association, also they invite all neutrosophic researchers around the globe to join with NSIA by adopting new branches in their countries, the website <http://neutrosophicassociation.org/> is the main site that collects the branches of NSIA, since 2014 there are many papers and books containing new mathematical concepts in neutrosophic optimization, neutrosophic algebra, neutrosophic topological spaces were published by Huda E. Khalid et al [22-27].

As mentioned in the previous sub-sections (1.1. to 1.8 sections), the authors used the concept of triangular single-valued neutrosophic numbers with the notion of the neutrosophic structured element to conclude the best alternatives (in table 4, there are three alternatives for patients to be treated are Al-Khansa Hospital, Ibn-Sina Hospital, Telafer Hospital), also there are ten questions or statements that regarded as the attributes of the nurses' staffs in these hospitals, and should notice table (4) revealed the key role in understanding nurses' attitudes toward COVID-19, it is clearly table (4) has been partitioned into five copies depending on the nurses' opinions which are: (strongly agree, agree, No- idea, disagree, strongly disagree).

The followings Matlab commands are used to conclude the results, our Matlab version was **R2020b (9. 9. 0. 1467703)**.

3.1 Matlab Program and Results for Al-Khansa Hospital:

```
>> syms x;
>> y=1-((0.391*x+0.537)^0.1)*((0.9375-0.03125*x)^0.1)*((0.78333-0.11667*x)^0.1)*((0.924242-
0.015148*x)^0.1)*((0.667-0.138*x)^0.1)*((0.8975-0.05126*x)^0.1)*((0.6129-0.1931*x)^0.1)*((0.7-
0.06*x)^0.1)*((0.703125+0.171875*x)^0.1)*((0.98333-0.01667*x)^0.1)
y =
1 - (15/16 - x/32)^(1/10)*(7/10 - (3*x)/50)^(1/10)*((11*x)/64 + 45/64)^(1/10)*(667/1000 -
(69*x)/500)^(1/10)*((391*x)/1000 + 537/1000)^(1/10)*(6129/10000 - (1931*x)/10000)^(1/10)*(359/400 -
(2563*x)/50000)^(1/10)*(78333/100000 - (11667*x)/100000)^(1/10)*(98333/100000 -
(1667*x)/100000)^(1/10)*(2081207963400081/2251799813685248 -
(8732227475892259*x)/576460752303423488)^(1/10)
>> m=((0.1222*x+0.0366)^0.1)*((0.015625*x+0.109375)^0.1)*((0.15-
0.01667*x)^0.1)*((0.27273)^0.1)*((0.04766*x+0.1429)^0.1)*((0.1667-
0.0128*x)^0.1)*((0.03222*x+0.6452)^0.1)*((0.12)^0.1)*((0.046875*x+0.140625)^0.1)*((0.05*x+0.08333)^0.1
)
m =
(1801030128282753805662705420673*(x/64 + 7/64)^(1/10)*((3*x)/64 + 9/64)^(1/10)*((611*x)/5000 +
183/5000)^(1/10)*(1667/10000 - (8*x)/625)^(1/10)*((1611*x)/50000 + 1613/2500)^(1/10)*((2383*x)/50000
+ 1429/10000)^(1/10)*(3/20 - (1667*x)/100000)^(1/10)*(x/20 +
8333/100000)^(1/10))/2535301200456458802993406410752
>> r=(1-x)*(2+y-m)
r =
(x - 1)*((1801030128282753805662705420673*(x/64 + 7/64)^(1/10)*((3*x)/64 + 9/64)^(1/10)*((611*x)/5000
+ 183/5000)^(1/10)*(1667/10000 - (8*x)/625)^(1/10)*((1611*x)/50000 +
1613/2500)^(1/10)*((2383*x)/50000 + 1429/10000)^(1/10)*(3/20 - (1667*x)/100000)^(1/10)*(x/20 +
8333/100000)^(1/10))/2535301200456458802993406410752 + (15/16 - x/32)^(1/10)*(7/10 -
(3*x)/50)^(1/10)*((11*x)/64 + 45/64)^(1/10)*(667/1000 - (69*x)/500)^(1/10)*((391*x)/1000 +
```

```

537/1000)^(1/10)*(6129/10000 - (1931*x)/10000)^(1/10)*(359/400 -
(2563*x)/50000)^(1/10)*(78333/100000 - (11667*x)/100000)^(1/10)*(98333/100000 -
(1667*x)/100000)^(1/10)*(2081207963400081/2251799813685248 -
(8732227475892259*x)/576460752303423488)^(1/10) - 3)
>> t=(1+x)^(2+y-m)
t =
-(x + 1)*((1801030128282753805662705420673*(x/64 + 7/64)^(1/10)*((3*x)/64 +
9/64)^(1/10)*((611*x)/5000 + 183/5000)^(1/10)*(1667/10000 - (8*x)/625)^(1/10)*((1611*x)/50000 +
1613/2500)^(1/10)*((2383*x)/50000 + 1429/10000)^(1/10)*(3/20 - (1667*x)/100000)^(1/10)*(x/20 +
8333/100000)^(1/10))/2535301200456458802993406410752 + (15/16 - x/32)^(1/10)*(7/10 -
(3*x)/50)^(1/10)*((11*x)/64 + 45/64)^(1/10)*(667/1000 - (69*x)/500)^(1/10)*((391*x)/1000 +
537/1000)^(1/10)*(6129/10000 - (1931*x)/10000)^(1/10)*(359/400 -
(2563*x)/50000)^(1/10)*(78333/100000 - (11667*x)/100000)^(1/10)*(98333/100000 -
(1667*x)/100000)^(1/10)*(2081207963400081/2251799813685248 -
(8732227475892259*x)/576460752303423488)^(1/10) - 3)
>> Fvpaint1 = vpaintegral(r,x,[-1 0])
Fvpaint1 =3.20536
>> Fvpaint2 = vpaintegral(t,x,[0 1])

Fvpaint2 =3.11594
>> scorefunction=(1/9)*( Fvpaint1+ Fvpaint2)
scorefunction =0.70236616698101494068081270446176

```

3.2 Matlab Program and Results for Ibn-Sina Hospital:

```

>> syms x;
>> y=1-((1-(-0.296341*x+0.444))^0.1)*((1-(0.048387+0.016137*x))^0.1)*((1-(0.121-0.0169*x))^0.1)*((1-
(0.143+0.04776*x))^0.1)*((1-(0.31395+0.15116*x))^0.1)*((1-(0.12+0.08*x))^0.1)*((1-
(0.33871+0.1129*x))^0.1)*((1-(0.2931+0.086203*x))^0.1)*((1-(0.17647-0.11765*x))^0.1)*((1-(0.015625-
0.015625*x))^0.1)
y =
1 - (22/25 - (2*x)/25)^(1/10)*(x/64 + 63/64)^(1/10)*((169*x)/10000 + 879/1000)^(1/10)*(857/1000 -
(597*x)/12500)^(1/10)*(13721/20000 - (3779*x)/25000)^(1/10)*(66129/100000 -
(1129*x)/10000)^(1/10)*((2353*x)/20000 + 82353/100000)^(1/10)*(7069/10000 -
(3105790389425751*x)/36028797018963968)^(1/10)*((5338404868698401*x)/18014398509481984 +
139/250)^(1/10)*(68570943235214717/72057594037927936 -
(1162793394990043*x)/72057594037927936)^(1/10)

```

```

>> m=((0.037037
*x+0.0740741)^0.1)*((0.00161*x+0.19516)^0.1)*((0.2758+0.06891*x)^0.1)*((0.094741*x+0.14236)^0.1)*((0.
093023*x+0.16279)^0.1)*((-0.1*x+0.26)^0.1)*((0.003224*x+0.06774)^0.1)*((-0.086204*x+0.08621)^0.1)*((-
0.01472 *x+0.2794)^0.1)*((0.015625*x+0.046875)^0.1)
m =
((7434037861704949*x)/2305843009213693952 + 3387/50000)^(1/10)*(13/50 - x/10)^(1/10)*(x/64 +
3/64)^(1/10)*(1397/5000 - (46*x)/3125)^(1/10)*((6891*x)/100000 + 1379/5000)^(1/10)*((161*x)/100000 +
4879/25000)^(1/10)*((6826808516747331*x)/72057594037927936 +
3559/25000)^(1/10)*((2668797110382737*x)/72057594037927936 +
2668800713262439/36028797018963968)^(1/10)*((3351506785095085*x)/36028797018963968 +
16279/100000)^(1/10)*(8621/100000 - (1552913209111385*x)/18014398509481984)^(1/10)
>> r=(1-x)*(2+y-m)
r =
(x - 1)*((22/25 - (2*x)/25)^(1/10)*(x/64 + 63/64)^(1/10)*((169*x)/10000 + 879/1000)^(1/10)*(857/1000 -
(597*x)/12500)^(1/10)*(13721/20000 - (3779*x)/25000)^(1/10)*(66129/100000 -
(1129*x)/10000)^(1/10)*((2353*x)/20000 + 82353/100000)^(1/10)*(7069/10000 -
(3105790389425751*x)/36028797018963968)^(1/10)*((5338404868698401*x)/18014398509481984 +
139/250)^(1/10)*(68570943235214717/72057594037927936 -
(1162793394990043*x)/72057594037927936)^(1/10) + ((7434037861704949*x)/2305843009213693952 +
3387/50000)^(1/10)*(13/50 - x/10)^(1/10)*(x/64 + 3/64)^(1/10)*(1397/5000 -
(46*x)/3125)^(1/10)*((6891*x)/100000 + 1379/5000)^(1/10)*((161*x)/100000 +
4879/25000)^(1/10)*((6826808516747331*x)/72057594037927936 +
3559/25000)^(1/10)*((2668797110382737*x)/72057594037927936 +
2668800713262439/36028797018963968)^(1/10)*((3351506785095085*x)/36028797018963968 +
16279/100000)^(1/10)*(8621/100000 - (1552913209111385*x)/18014398509481984)^(1/10) - 3)
>> t=(1+x)*(2+y-m)
t =
-(x + 1)*((22/25 - (2*x)/25)^(1/10)*(x/64 + 63/64)^(1/10)*((169*x)/10000 + 879/1000)^(1/10)*(857/1000 -
(597*x)/12500)^(1/10)*(13721/20000 - (3779*x)/25000)^(1/10)*(66129/100000 -
(1129*x)/10000)^(1/10)*((2353*x)/20000 + 82353/100000)^(1/10)*(7069/10000 -
(3105790389425751*x)/36028797018963968)^(1/10)*((5338404868698401*x)/18014398509481984 +
139/250)^(1/10)*(68570943235214717/72057594037927936 -
(1162793394990043*x)/72057594037927936)^(1/10) + ((7434037861704949*x)/2305843009213693952 +
3387/50000)^(1/10)*(13/50 - x/10)^(1/10)*(x/64 + 3/64)^(1/10)*(1397/5000 -
(46*x)/3125)^(1/10)*((6891*x)/100000 + 1379/5000)^(1/10)*((161*x)/100000 +
4879/25000)^(1/10)*((6826808516747331*x)/72057594037927936 +
3559/25000)^(1/10)*((2668797110382737*x)/72057594037927936 +

```

```

2668800713262439/36028797018963968)^(1/10)*((3351506785095085*x)/36028797018963968 +
16279/100000)^(1/10)*(8621/100000 - (1552913209111385*x)/18014398509481984)^(1/10) - 3)
>> Fvpaint1= vpaintegral(r,x,[-1 0])
Fvpaint1 =3.15183
>> Fvpaint2 = vpaintegral(t,x,[0 1])
Fvpaint2 = 3.1303
>> scorefunction=(1/9)*( Fvpaint1+ Fvpaint2)
scorefunction = 0.69801434253081771214022310800829

```

3.3 Matlab Program and Results for Telafer Hospital:

```

>> syms x;
>> y=1-((1-(-0.27272*x+0.4091))^0.1)*((1-(0.185185+0.185185*x))^0.1)*((1-(0.111+0.0736*x))^0.1)*((1-
(0.125+0.06944*x))^0.1)*((1-(0.3654+0.25*x))^0.1)*((1-(0.1154+0.082938*x))^0.1)*((1-
(0.35+0.1833*x))^0.1)*((1-(0.222+0.0553*x))^0.1)*((1-(-0.02083*x+0.1875))^0.1)*((1-
(0.01786*x+0.01786))^0.1)
y =
1 - (14678402121503563/18014398509481984 -
(3335996387978421*x)/18014398509481984)^(1/10)*(889/1000 - (46*x)/625)^(1/10)*(7/8 -
(217*x)/3125)^(1/10)*(3173/5000 - x/4)^(1/10)*(389/500 - (553*x)/10000)^(1/10)*(13/20 -
(1833*x)/10000)^(1/10)*((3409*x)/12500 + 5909/10000)^(1/10)*((2083*x)/100000 +
13/16)^(1/10)*(49107/50000 - (893*x)/50000)^(1/10)*(4423/5000 -
(5976312734317667*x)/72057594037927936)^(1/10)
>> m=(-0.09091091*x+0.09091091)^0.1*(-
0.047285*x+0.1379)^0.1*((0.018515*x+0.2037)^0.1)*((0.222)^0.1)*((0.01925*x+0.09615)^0.1)*((-
0.05765*x+0.0962)^0.1)*((0.06667*x+0.1)^0.1)*((0.08344*x+0.19444)^0.1)*((-
0.125*x+0.25)^0.1)*((0.07143*x+0.07143)^0.1)
m =
(3874316284374853*(6550821446398603/72057594037927936 -
(6550821446398603*x)/72057594037927936)^(1/10)*(1/4 - x/8)^(1/10)*((77*x)/4000 +
1923/20000)^(1/10)*(481/5000 - (1153*x)/20000)^(1/10)*((1043*x)/12500 +
4861/25000)^(1/10)*((6667*x)/100000 + 1/10)^(1/10)*((7143*x)/100000 +
7143/100000)^(1/10)*(1379/10000 -
(6814486668166845*x)/144115188075855872)^(1/10)*((5336585414448943*x)/288230376151711744 +
2037/10000)^(1/10))/4503599627370496
>> r=(1-x)*(2+y-m)
r =
(x - 1)*((3874316284374853*(6550821446398603/72057594037927936 -
(6550821446398603*x)/72057594037927936)^(1/10)*(1/4 - x/8)^(1/10)*((77*x)/4000 +

```

```

1923/20000)^(1/10)*(481/5000 - (1153*x)/20000)^(1/10)*((1043*x)/12500 +
4861/25000)^(1/10)*((6667*x)/100000 + 1/10)^(1/10)*((7143*x)/100000 +
7143/100000)^(1/10)*(1379/10000 -
(6814486668166845*x)/144115188075855872)^(1/10)*((5336585414448943*x)/288230376151711744 +
2037/10000)^(1/10))/4503599627370496 + (14678402121503563/18014398509481984 -
(3335996387978421*x)/18014398509481984)^(1/10)*(889/1000 - (46*x)/625)^(1/10)*(7/8 -
(217*x)/3125)^(1/10)*(3173/5000 - x/4)^(1/10)*(389/500 - (553*x)/10000)^(1/10)*(13/20 -
(1833*x)/10000)^(1/10)*((3409*x)/12500 + 5909/10000)^(1/10)*((2083*x)/100000 +
13/16)^(1/10)*(49107/50000 - (893*x)/50000)^(1/10)*(4423/5000 -
(5976312734317667*x)/72057594037927936)^(1/10) - 3)
>> t=(1+x)^(2+y-m)
t =
-(x + 1)*((3874316284374853*(6550821446398603/72057594037927936 -
(6550821446398603*x)/72057594037927936)^(1/10)*(1/4 - x/8)^(1/10)*((77*x)/4000 +
1923/20000)^(1/10)*(481/5000 - (1153*x)/20000)^(1/10)*((1043*x)/12500 +
4861/25000)^(1/10)*((6667*x)/100000 + 1/10)^(1/10)*((7143*x)/100000 +
7143/100000)^(1/10)*(1379/10000 -
(6814486668166845*x)/144115188075855872)^(1/10)*((5336585414448943*x)/288230376151711744 +
2037/10000)^(1/10))/4503599627370496 + (14678402121503563/18014398509481984 -
(3335996387978421*x)/18014398509481984)^(1/10)*(889/1000 - (46*x)/625)^(1/10)*(7/8 -
(217*x)/3125)^(1/10)*(3173/5000 - x/4)^(1/10)*(389/500 - (553*x)/10000)^(1/10)*(13/20 -
(1833*x)/10000)^(1/10)*((3409*x)/12500 + 5909/10000)^(1/10)*((2083*x)/100000 +
13/16)^(1/10)*(49107/50000 - (893*x)/50000)^(1/10)*(4423/5000 -
(5976312734317667*x)/72057594037927936)^(1/10) - 3)
>> Fvpaint1= vpaintegral(r,x,[-1 0])
Fvpaint1 = 3.10822
>> Fvpaint2 = vpaintegral(t,x,[0 1])
Fvpaint2 =3.20678
>> scorefunction=(1/9)*( Fvpaint1+ Fvpaint2)
scorefunction =
0.70166648434761336943715153640571

```

From the definition (1.3), the all score degrees of the above alternatives are:

0.70236616698101494068081270446176 is the score degree of Al-Khansa hospital.

0.69801434253081771214022310800829 is the score degree of Ibn Sina hospital.

0.70166648434761336943715153640571 is the score degree of Telafer hospital.

Consequently, the ranking order of the above three alternatives are

Al-Khansa hospital > Telafer hospital > Ibn Sina hospital.

So the best hospital was Al-Khansa hospital, while Telafer hospital ranked as second hospital, the final hospital was Ibn Sina hospital.

4. Discussion:

In the current study, the participants were the nurses who were directly involved with COVID-19 patients. We assessed their knowledge, and attitude to protect them and prevent the further spread of the infection. It is reported that nurses are more prone to infection due to close contact with the patients [28]. In this study, the data of 90 participants were analyzed.

The main finding of the present study showed in table (1) the majority of nurses (55%) were from the age group (31-40) years, this is in agreement with Gaudencia C. et al 2020 who showed the majority of nurses (21%) were from the age group (≥ 40) years, also shows that the total number of males were 62 % and females were 37%. Usually in other studies, a higher female-to-male ratio has been observed see ref. [29] but contrary to other studies in our study we found a higher number of males. This is because of the reason that in Iraq country males are usually the bread earner and they have no other option, on the other hand, many female nurses have quit their jobs and resigned due to the family burden and the wrong view of some families towards the nursing profession [30], also from our study the table (1) showed a high percentage of nurses (80%) are married, About concerning the level of education, the majority of the nurses (40%) were graduate from Institute, this is disagreement with Gaudencia C, et al 2020 where it showed the majority of nurses (55%) were they had a bachelors.

While regarding an infected the covid19 the result showed the majority of nurses (53%) are infected the covid19. Finally, in terms of experience years, the majority of nurses (42%) had an experience of more than eleven years this is in agreement with [31] Yaling Peng, et al 2020 most of the nurses who participated had more than 8 years of experience.

Since the outbreak in epicenter Wuhan in December 2019, COVID-19 has rapidly become a threat to global public health and led to substantial socioeconomic damages in the whole world. Vigorous measurements have been enforcedly implemented including the lockdown of Wuhan and community quarantine by Chinese central and local governments since the outbreak to mitigate the disease effectively. In addition, public health education has been recognized as an effective measure to prevent and control public health emergencies for public preparedness against such situations. It will lead the public to acquire appropriate knowledge, mitigate panic and seek a positive attitude, and comply with aligned and desired practices. All these KAP elements have been considered crucial to ensure effective prevention and control of the pandemic [32].

Also, the main finding of these studies showed that the majority of the nurses had good knowledge (52%), while the majority of the nurses had fair attitudes (53%). these results agree with other findings that suggest people tend to express negative emotions, such as

anxiety and panic, during a pandemic that could affect their attitude [33] Nevertheless, our results show that the participants' high knowledge of COVID-19 translates into good and safe practices, during the COVID-19 pandemic, which suggests that the practices of Iraq residents are very cautious. Almost 100% of respondents refrained from attending social events, 100% avoided crowded places, and 96 % said the coronavirus is transmitted by direct contact and through respiratory droplets from an injured person these are positive things about preventing the spread of the disease. and 83% of Respondents said using personal protective measures such as Washing hands with soap and water and using masks prevents transmission of the disease, as a result of Iraqi health authorities providing education and outreach materials, to increase public understating of the disease and influence behavioral change.

Nurses' knowledge of covid19 is presented in Table (3). Most of the nurses' samples were good knowledge of the Coronavirus that Corona is a viral infection and the main clinical symptoms of Corona are fever, cough, sore throat, shortness of breath, muscle pain/fatigue, loss of sense of smell and taste and also the way to prevent infection of Coronavirus, is avoid going to crowded places such as train stations and avoid using public transportation, these criteria represented (100%), also the knowledge of symptoms and signs of Coronavirus are loss of appetite, nausea, and cramping, and diarrhea which represents (73.33%,76.66%) respectively. This finding is consistent with other studies that have shown satisfactory levels of knowledge, among the Iraqi population, for epidemics, such as MERS [34, 35]. In our study, the high rate of correct answers to knowledge-related questions among participants was not surprising. This may be due to the characteristics of the sample, as 40% had a diploma of Nursing degree. It may also be due to the distribution of the questionnaire, amid the COVID-19 outbreak. In that particular period, people may have gained awareness and knowledge about the disease and its transmission, via television, news and social media, to protect themselves and their families. The positive association found between knowledge, educational background and age, supports our claim. Also, this study agrees with [36], and with Mohammed K. Al-Hanawi et al 2020 [25], who indicated that most of the participants in the study (98%) were aware of the clinical symptoms, and 96% knew that there is no clinically approved treatment for COVID-19 as of the date of this manuscript. Viral infections have been documented to be highly contagious among people nearby [37]. However, approximately half of the respondents were unaware that SARS-CoV-2 could spread from person to person nearby. also in the same study, they found (44%) of the population had little knowledge of when and whom to wear masks to prevent infection. According to the WHO and the CDC, faces mask should only be worn by those who are sick or caring for people suspected of having COVID-19 [37,38]. These findings highlight the need to continue to encourage and emphasize maintaining social distancing, as a means of preventing the spread of the virus.

This manuscript indicates that ignorance about the Corona disease can be dangerous, Coronavirus is transmitted by direct contact and through respiratory droplets from the injured person, and the isolation and treating infected people with the Coronavirus, effective ways to

limit the spread Virus reaches to represent (96%). The question related to washing hands with soap and water and using masks prevents disease transmission, and also that the elderly and patients suffering from chronic diseases are more likely to suffer from severe infection and death is represented (83.33%). But knowledge about People who have been in contact with a person infected with the Coronavirus should be put in suitable place quarantine. In general, under observation for 14 days represent (76.66%). While the knowledge about Antibiotics is used to treat corona (51%). Finally, the knowledge regarding the fact that Children and young people do not need to take preventive measures to infection with Coronavirus represents (20%). It is important to note that there has been plenty of efforts at all levels by the government, including public awareness campaigns. The Iraqi Ministry of Health (MOH) has conducted an intensive awareness campaign, communicated via its website, television and various social media. The MOH has produced a guide to COVID-19, to provide residents with facts and precautionary messages in more than 10 languages. The MOH also works with the public and the media, especially via social media platforms. These early actions on engaging the public in prevention and control measures, as well as efforts to combat rumours and misinformation, have been greatly expanded. This unique experience has helped the Arab and international governments in taking prompt response and precautionary measures against COVID-19 to control its spread [39].

Table (4) revealed the key to understanding nurses' attitudes toward COVID-19, most nurses had good attitudes about the put facemask on known or suspected patients represent (88%), This study agrees with Mohammed K. Al-Hanawi et al 2020 [35], where they indicated that most of the participants showed a positive and optimistic attitude toward COVID-19. Approximately 94% concur that the virus can be successfully controlled, and 97% are convinced that the government will control the pandemic. Positive attitudes and high confidence in the control of COVID-19 can be explained by the government's unprecedented actions and prompt response in taking stringent control and precautionary measures against COVID-19, to safeguard citizens and ensure their well-being. These measures include the lockdown, and the suspension of all domestic and international flights, prayer at mosques, schools and universities, and the national curfew imposed on citizens. This finding is consistent with a recent study conducted in China, where the majority of participants were convinced that the disease is curable and that their country will combat the disease [40].

Also, in Table (4) there were two kinds of analysis, the classical analysis shows that only (8%) of nurses agree to the place known or suspected patients in adequately ventilated single rooms, and (44%) didn't have any idea about all health staff members wear protective clothing, But only (21%) said the avoid moving and transporting patients out of their area unless necessary, and (66%) they said should frequently clean hands by using alcohol-based hand rub or soap and water, But only (21%) said the routinely clean and disinfect surfaces in contact with known or suspected patients these results consistent with Blendon RJ. et al 2004, that suggests people tend to express negative emotions, such as anxiety and panic, during a pandemic could affect their attitude [41], the new modern analysis that specified to measure

the performance of nurses' staffs in three Iraqi hospitals, in this technique the authors used triangular single-valued neutrosophic numbers and neutrosophic structured elements in multi-attribute decision making to decide which of the hospital is the best hospital in its nurses' staff, it is clearly table (4) has been partitioned into five copies depending on the nurses' opinion which are: (strongly agree, agree, No-idea, disagree, strongly disagree), and their answers on the ten questions.

When asking more questions concerning attitudes, about (65%) of nurses agreed on cleaning and disinfecting environmental surfaces, But only (18%) of them didn't agree with the practice of social distancing, and (44%) agree with prefer having more attendants with the patient in the hospital, Finally, Only (3%) they said want to continue working with corona patients. Patients with poor knowledge were more likely to have poor practice. This finding is consistent with a study in China. [42] This might be due to the reason that knowledge is the main modifier of positive attitudes toward COVID-19 preventive practices and these activities are practised after having awareness and knowledge of the activities to be performed. Knowledge of COVID-19 decreases the risk of infection by improving patient practices [42].

5. Conclusion and Recommendation:

The majority of nurses fifty-five percentage were from the age group (31-40) years, also the majority of nurses (sixty-two percent) were males more than half number, concerning the level of education majority of

nurses (forty percentage) were graduates from Institute, the majority of nurses fifty-three percent they were had contracted COVID-19, majority of nurses forty-two percent they were had experience of more than eleven years, we can be concluded from this study that the nurses have relatively good knowledge, but had a poor attitude about the COVID-19.

According to the traditional results, the study recommended holding seminars, lectures and educational conferences in hospitals about the Coronavirus to improve the nurses' knowledge, especially in hospitals where there are cases of Coronavirus, because the nurses will be in direct contact with patients suffering from the pandemic. also raising awareness about the spread of disease by including Covid19 education in schools and colleges curricula is highly needed to prevent the transmission of the disease. While the results gained from section (3) that used intelligent neutrosophic technique illustrate that the attributes of nurses' staffs in Al-Khansa hospital were preferable for patients to be as healthcare staff, the second best hospital was Telafer hospital, the third-ranked order went for Ibn-Sina hospital.

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