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Health culture and factors associated with it among service providers in Hussein processions during the arbeenia mass gathering in Babylon Governorate, 2024 by using statistical analysis

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Abstract : Using Exploratory factor analysis.(EFA) as a modern and advanced statistical model in the process of data analysis and health education is important for every citizen, but when a large crowd occurs, medical teams and statistical methods must intervene to address the issue and develop an action plan to avoid the occurrence of patient injuries or epidemic infections among this group of citizens. The importance of combining the factor analysis method with disease transmission emerged from here. The occasion of the Arbaeen pilgrimage is a major event as it brings together millions of citizens annually in a small geographical area. The reason for the lack of health awareness may be the spread of epidemics and diseases. Through this research, we distributed questionnaire forms to visitors infected with diseases, specifically in the year 2024, where the size of the research sample was (600 observations) divided between males and females in numbers respectively (536) and (64). (10 basic variables) were established that have a direct impact on the spread of infection or diseases among visitors. The factor analysis method was used as a statistical method to process this data , The value of the test (KMO) was equal to the test (0.893) and the value of the test (Bartlett's) was equal to (0.00) , which indicates the adequacy of the studied sample and its suitability with the exploratory factor analysis method. as it works this method to reduce the variables into main factors. It became clear to us after conducting the analysis that there is There were only two main factors, and the variance value for the first factor was (80.657) and the second factor was (10.743), meaning that these factors explain a value of (91.400) of the total variance value for the phenomenon under study, which is a good and large value, noting that the data were analyzed statistically using the statistical application (SPSS).

Keywords: Exploratory factor analysis(EFA), Arbaeen pilgrimage, Statistical Package for the Social Sciences (SPSS), latent roots.

1-1**INTRODUCTION:** To know the extent of the impact of statistical analysis on all sciences, including medical sciences, it was necessary to study a medical phenomenon and collect information about it. This information was collected in a questionnaire form containing basic variables, which is the focus of statistical analysis work. Collecting and unpacking this data using statistical methods and coming up with the results highlights the importance of factor analysis in studying medical phenomena. The Arbaeen visit is considered a major global event and an event that affects a large segment of the global community, which is specifically Muslims, as the visit of Imam Hussein is one of the important religious rituals for Muslims in the world. This visit takes place in the city of Karbala, one of the governorates of the State of Iraq, and consists of going to visit the tomb of Imam Hussein, who is buried in Karbala Governorate. In order to reach Karbala Governorate, one passes through many governorates, including Babylon Governorate, which is considered the main crossing point for the entry of visitors who come on foot to perform the visit rituals. One of the most important phenomena that the researcher observed is the process of transmission of infection for a group of diseases, some of which may be chronic or seasonal, and the other section is bacterial or viral. Here, it was necessary to develop an action plan to know the most important reasons for transmission Diseases and knowledge of the correct methods in order to protect visitors and prevent them from infection, so the researcher took a sample of visitors arriving through Babylon Governorate who were infected with diseases. This sample was represented by (600 observations). The sample was divided into (536 male observations) and (64 female observations). Each observation is a specific disease case. Information was taken by medical teams deployed in Babylon Governorate to treat visitors. Questionnaire forms were filled out and information was collected in an

accurate statistical manner in order to identify the most important causes of infection and to know whether there is a health culture among visitors and to know the treatment methods to avoid the exacerbation of disease cases. Accordingly, a group of questions was developed, and each question is considered an independent variable, and their number is (10 variables). These independent variables are linked to the response variable (the dependent variable), which represents health culture. The factor analysis method was used as a statistical method to analyze the data that was collected. This data was unloaded into the computer. With the help of the ready statistical application (SPSS), the data was analyzed and the data was also examined using the (KMO) test and the (Bartlitz) test.) These are statistical tests to determine the extent of the suitability of the data for this method of statistical analysis, which is the method of Exploratory factor analysis.(EFA), and it will be explained in the theoretical aspect of this research in detail, noting that factor analysis is one of the important statistical analytical methods in the aspect of analyzing health and medical data. The history of using this method goes back to the scientist (Lewis Thurston) in 1931, who is considered the first to use this method in the process of analyzing data and wrote in psychology and psychophysics. The title of his research was (Multiple Practical Analysis). After that, in the year (1934), he wrote another research entitled (Mental Factors). After that, practical research continued to use this statistical method.

1-2 Research Methodology:

This research adopted an analytical approach to identify the causes of infection transmission among visitors and how to protect visitors from infection transmission. We explained the analytical tools in the theoretical aspect and analyzed the data in the practical aspect using the SPSS statistical program. This analysis was then entered into the program's database to achieve good results that benefit society and the recipient. The research was divided into an introduction, then the theoretical aspect, then the practical aspect, and finally, conclusions and recommendations.

1-3 Research Problem:

Using the factor analysis model, one of the valuable statistical models, yields good results in reducing the independent variables to a few basic components, focusing attention on the research problem and the phenomenon under study. The transmission of infection among visitors may lead to the spread of diseases in epidemic form. Given that the number of visitors reaches millions, this poses a major challenge facing medical teams. It was necessary to develop an analytical and statistical research plan to identify the causes of disease transmission and develop medical awareness guidelines for visitors to prevent the spread of diseases in epidemic form, protect visitors, and highlight the importance of health education for visitors.

1-4 Research objective:

The research aims to use a robust statistical method to analyze data. Factor analysis is highlighted here as one of the most important and robust scientific statistical methods. The research aims to familiarize researchers with the importance of statistical analysis in medical data and educate visitors about infectious diseases and how to avoid contracting them. Statistical analysis helps reduce all variables that cause infection and disease transmission to a few analytical factors, as explained in the theoretical aspect. It also aims to assist visitors, educate them, and inform them of statistical health and medical knowledge.

1-5 Research Sample:

The study population consisted of pilgrims arriving to perform the Arbaeen pilgrimage to Imam Hussein (peace be upon him) via Babil Governorate, arriving on foot to Karbala Governorate. This population was divided into infected and non-infected pilgrims. This study relied on infected pilgrims. Therefore, a sample of 600 infected pilgrims was taken from this population. These pilgrims were divided into 536 males and 64 females. Medical teams diagnosed their medical conditions and collected questionnaire information based on a pre-prepared questionnaire to determine the most important causes of disease and methods for raising health awareness among pilgrims.

2-1 Factor Analysis: There are two types of factor analysis:[10, 9,8]

1. Exploratory factor analysis.(EFA)
2. Confirmatory factor analysis. (CFA)

- In this research, we adopted the exploratory factor analysis method due to its importance and suitability for the data of the phenomenon under study.

2-2 Exploratory factor analysis.(EFA)

This statistical method involves identifying a set of basic factors, called principal components, derived from or derived from a set of independent variables under study. This method is used to analyze related variables that are difficult to represent visually due to the complexity of the phenomenon or the size of the data . Therefore, the phenomenon data is descriptive data. A set of questions representing the independent variables was identified and ranked to provide data that could be analyzed. Factor analysis is also known as the statistical method of reducing a set of variables and representing them into specific factors that represent the phenomenon under study and interpret their results accurately and concisely. Typically, the study variables are descriptive, making them difficult to represent, such as intelligence

quotient (IQ), depression, the cause of addiction, or the cause of infection. Therefore, a set of questions is posed to accurately represent the phenomenon. These questions represent the independent variables under study.

2-3 The function of the original variables and their constituent factors for Exploratory factor analysis:[1,2,4,5]

It is worth noting that the main factors comprising the factor analysis function must explain the greatest possible amount of variance in the independent variables under study and are written in the following form.

$F_1 = \alpha_{11}X_1 + \alpha_{12}X_2 + \alpha_{13}X_3 + ... + \alpha_{1n}X_n$ - (1)

$F_2 = \alpha_{21}X_1 + \alpha_{22}X_2 + \alpha_{23}X_3 + ... + \alpha_{2n}X_n$ - (2)

$F_3 = \alpha_{31}X_1 + \alpha_{32}X_2 + \alpha_{33}X_3 + ... + \alpha_{2n}X_n$ - (3)

....

$F_n = \alpha_{m1}X_1 + \alpha_{m2}X_2 + \alpha_{m3}X_3 + ... + \alpha_{mn}$, $m > n$ - (4)

Note that -

- F_n = represents The sequence of main factors .
- α_{mn} = represents the value of the correlation coefficient .
- X_n = Represents the independent variables .
- m = Represents the number of variables .
- n = represents The number of main factors .

The coefficients in the equations above can be rewritten as a matrix, called a factor analysis matrix. The intersection of the row and column of the variables represents the value of the correlation coefficient. Some basic things to know when writing a matrix are:

First, the first factor must be the one most closely related to the variables under study.

Second, each factor must have zero coefficients.

Third, it can be easily interpreted.

For example, when the correlation coefficient for the variables under study is 0.63 and there are two variables, the matrix should be written as follows:

Variables	1	2
1	1.00	0.63
2	0.63	1.00

2-4 Exploratory factor analysis by Using SPSS.[3,7]

The ready-made statistical application (SPSS) is an abbreviation for the Statistical Package for the Social Sciences. It is one of the most important statistical programs through which data is analyzed to arrive at results and interpret the phenomena studied. The factor analysis method is applied in the SPSS program. After identifying the independent variables, which in this study were (10 variables), the observations are entered into the program's (variable view) window, which represents the size of the studied sample, which was (600 observations). The data view is then used, followed by the (analyze) tab. A drop-down menu appears from which the (dimension reduction) option is selected. Then, we select (factor). A dialog box appears, where we place the studied independent variables in the (variables) field. We then click the (OK) button to execute the analysis, as shown in the practical aspect of this research.

2-5 The KMO test, an abbreviation for Kaiser, Myers, Olkin,[2,9,10]

It is used to test the adequacy of the sample and the suitability of the data used for factor analysis. When the KMO value is > 0.5, this indicates the validity of the data and the adequacy of the sample for factor analysis. It is worth noting that the KMO value ranges from +1 to 0. The closer the test value is to unity, the more valid the data and the adequacy of the sample are. The closer it is to zero, the less valid the data and the less adequate the sample being studied.

2-6 Bartlett's test: Named after Morris Stevenson Bartlett[1,2,10]

It is also known as the homogeneity test. Statistical significance requires that the matrix be a unit matrix and that the test value be at a significance level of α 0.05.

3-1 Practical part .

The data were analyzed using the SPSS program, by transcribing the data from the studied sample, which amounted to (600 observations). Ten basic independent variables were identified for the studied phenomenon and analyzed using the factor analysis method. The studied variables are shown in the table below.

Table No. (1) shows the studied independent variables and their titles.

4 The variable's title

Variable	Title of variable
X1	Are you interested in learning/reading about health topics?
X2	Are there health topics you research or research?
X3	Do you know the meaning of contagious/infected person?
X4	Does the infection/disease become apparent once symptoms appear?
X5	To what extent does your health awareness reflect on visitors during the service?
X6	Do you reflect your health awareness on family and relatives?
X7	Does your health awareness influence your understanding of the instructions/instructions of both the doctor and pharmacist?
X8	Do you know what the basic laboratory tests are?
X9	Is there a difference between ultrasound and MRI?
X10	Is periodic/routine screening important to avoid contracting diseases, especially chronic and immune-related ones?

After entering the data, as explained in the theoretical aspect, we conducted the KMO and Bartlett's Tests, as shown below.

Table (2) shows the value of the KMO and Bartlett's Tests.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.893
Bartlett's Test of Sphericity	Approx. Chi-Square	12583.423
	Df	45
	Sig.	.000

By reading the value of the (kmo) test in the table above, which is equal to (0.893), this indicates the sufficiency of the research sample and that the data are also suitable for conducting the analysis.

By reading the significance value of the (Bartlett's) test, it became clear to us that the sample is good and homogeneous, as shown by the significance level shown in the table, which is equal to (0.00). This is a very high and very strong significance percentage for conducting factor analysis.

Table No. (3) shows the initial values of the communalities.

	Initial	Extraction
Are you interested in learning/reading about health topics?	1.000	.908
Are there any health topics you are looking for or researching?	1.000	.929
Do you know the meaning of contagious person/infected person?	1.000	.896
Does the infection/disease appear as soon as symptoms appear?	1.000	.963
How does your health culture reflect on visitors while performing the Husseini service?	1.000	.928
Does your health education reflect on your family and relatives?	1.000	.941
Does your health education influence your understanding of the instructions/instructions given by your doctor or pharmacist?	1.000	.936
Do you know what basic laboratory tests are?	1.000	.763
Is there a difference between ultrasound and MRI?	1.000	.936
Is periodic/routine examination important to avoid diseases, especially chronic and immune diseases?	1.000	.940

Extraction Method: Principal Component Analysis .

From the data in the table above, it is clear that the value of the initial contributions in the main matrix equals one. For example, when reading the variable (x1), which represents whether you are interested in learning about or reading about health topics, the value of the contributions in the square of the variances for the variable equals (0.908). The value of the contributions in the variable (x2), which represents whether there are health topics that you are researching or learning about, was (0.929). These values indicate what the variable represents and its interpretation from the common factors, as the value of the factors ranges from (0 to 1). Note that the main factors obtained after conducting the analysis process are only two main factors.

Table No. (4) (Total Variance Explained) shows the percentage of factor variance from the aggregate and total variance of the factors from the latent roots of the studied components.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.066	80.657	80.657	8.066	80.657	80.657
2	1.074	10.743	91.400	1.074	10.743	91.400
3	.418	4.180	95.580			
4	.150	1.505	97.085			
5	.114	1.139	98.224			
6	.062	.623	98.847			
7	.057	.568	99.415			
8	.033	.332	99.747			
9	.021	.210	99.958			
10	.004	.042	100.000			

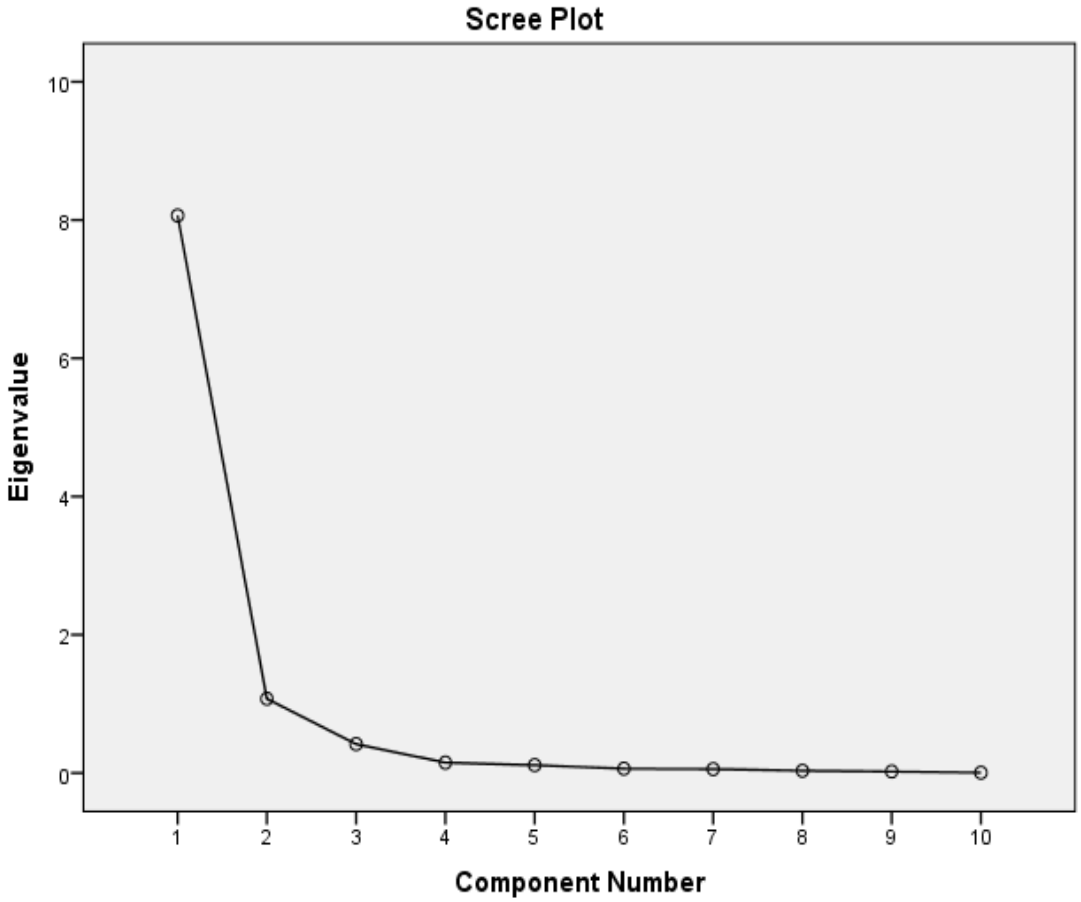
Extraction Method: Principal Component Analysis.

The table above is divided into two main parts: The first part (Initial Eigenvalues) is the value of the initial latent roots for each of the studied variables, which number (10 variables), and each variable has a latent root value, and this latent root represents a basic factor or main component, and thus we have ten basic factors. However, in factor analysis, the

factors whose latent roots are greater than one are taken and kept, and they are the ones that will represent the main components, i.e. the basic factors, and the rest of the components whose latent root is less than one are ignored. Thus, in our research, we have only two basic factors: the first factor, whose latent root value is equal to (8.066), and the latent root value of the second factor is equal to (1.074). As shown in the table above, to know what each factor explains in terms of the value of the variances, the latent root is divided by the total number of variables, which is ten variables in our research, and the value of the variances for the main factors appears to us. For example, we have the first factor, and we divide its value by (10), and the theory of the percentage shows us the value of the variance that it explains from the total variance of the studied variables. (8.066/10 = 80.66*100% = 80.66%) As for the second factor, it is (1.074/10 = 10.74*100% = 10.74). This value represents the value of what the basic factor represents in terms of the total variance ratio of the studied variables.

The second part of the table (Extraction Sums of Squared Loadings) shows us the basic latent roots corresponding to the main factors used in the analysis. It represents the sum of squared saturations from the latent roots of the main factors, which shows us the value of the first factor (80.657) and the value of the second factor (10.743). It also shows us the value of the cumulative variances (saturations), which total (91.400). This is an excellent value and a good explanation of the basic factors for the phenomenon under study. In other words, these factors explained a value of (91.400) of the total saturations, which amounted to (100.00). This means that the obtained factors have a strong and significant impact on the response variable.

Figure (1) Values of the latent roots for all components on the number scale



By observing the figure above, it becomes clear that only two of the basic factors with values greater than one were adopted in the factor analysis process. Factors with values of latent roots less than one were not adopted as basic factors.

Table (5) represents the basic component matrix.

Component Matrix[a]		
	Component	
	1	2
Are you interested in learning about/reading about health topics?	.946	-.116-

Are there any health topics you research or research?	.687	.676
Do you know what a contagious/infected person means?	.941	-.105-
Does infection/disease become apparent once symptoms appear?	.951	-.242-
To what extent does your health awareness impact visitors while performing the Husseini service?	.811	.521
Does your health awareness impact your family and relatives?	.962	.128
Does your health awareness influence your understanding of the instructions/guidelines of both the doctor and pharmacist?	.963	.094
Do you know what the basic laboratory tests are?	.784	-.385-
Is there a difference between an ultrasound and an MRI?	.925	-.281-
Is periodic/routine screening important to avoid contracting diseases, especially chronic and immune-related ones?	.964	-.103-
Extraction Method: Principal Component Analysis. a. 2 components extracted.		

By reading the table above, it becomes clear that the value of the components that enter into the formation of the basic factors and whose correlation coefficients are greater than (0.5), whether they are direct, i.e. in the positive direction, or inverse, i.e. in the negative direction, and that the number of variables that entered into the composition of the first factor is ten variables, meaning that all variables entered into the composition of the first factor. As for the second factor, the number of variables that entered into its composition was only two, namely the variable (x2), the value of the correlation coefficient in it was (0.676), and the variable (x5), the value of the correlation coefficient in it was equal to (0.521).

4-1 Conclusions:

i. Factor analysis should be used in analyzing medical data, as it is a scientific and practical method that identifies causes and focuses on a few concise factors to demonstrate the reason for the phenomenon being studied.

ii. Survey statistical teams present to study societal phenomena, including the phenomenon under study, should educate patients and encourage them to learn about the methods of disease transmission. They should also familiarize themselves with seasonal and chronic diseases and the difference between them and bacterial and viral diseases.

iii. 3. The covariance value for the first factor was (80.657) and for the second factor (10.743), which is an excellent and large value, indicating that the studied variables have a significant and direct impact on the health culture of visitors. This is a strength of the research and demonstrates the importance of the studied variables and their direct impact on the studied phenomenon (the response variable).

iv. 4. It is worth noting that all variables were included in the composition of the first factor. This means that there is a strong correlation coefficient between the studied variables. This indicates that the studied variables focus on the research problem, which is health awareness and culture among visitors.

4-2 Recommendations:

i. Other statistical methods should be studied for this type of data, such as the chi-square test or logistic regression, given that this phenomenon represents significant community importance, and visitors should be more widely educated about health education.

ii. We recommend using other statistical programs for data analysis, such as MATLAB or R.

iii. The researcher recommends, based on the results we obtained, that visitors should be directed to view the methods of protection and safety included as variables in the research in order to avoid exposure to injuries and diseases.

iv. The need to provide awareness campaigns for visitors, especially those who visit the Arbaeen pilgrimage.