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ASSESSMENT BY MULTIVARIATE ANALYSIS OF FAMILY SUPPORT TOWARDS THE OPIATE DEPENDENT: A CASE STUDY IN TERENGGANU

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ABSTRACT

This study involves the assessment of family support based on a new instrument (questionnaire). 200 respondents were selected and a multivariate analysis was used to analyze a large set of variables. A complete set of family support towards opiate dependents was analyzed by a principal component analysis, followed by a cluster analysis of the PCA results to determine the variation of the questionnaires and identify the characteristics of high variation questions. The result showed that there are 7 questions which have high variation in answers given by respondents (39.09% of cumulative variation), and a further analysis by cluster analysis categorized all those questions into 3 groups. Cluster 2 had the highest variation question (HVQ), and this was followed by cluster 1 with moderate variation question (MVQ) and the lowest variation question (LVQ) was in cluster 3.

Keywords: family support; opiate dependent; PCA; CA; spiritual.

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1. INTRODUCTION

An opiate is a class of drugs which includes opium, heroine, morphine, codeine and methadone [1]. In Malaysia, heroine and morphine combined with a collective rate of 64 percent, rank the highest as the type of opiates commonly abused [2]. Regarding the approaches adopted to curing addiction to opiates, methadone was introduced around 2005 with the aim of improving the addict's quality of life, reducing relapse, elevating their physical and mental condition as well as minimizing the risk of diseases spread due to the sharing of syringes or the method of drug preparation [3].

Besides the methadone approach, psychological treatment is almost as important considering that an individual does not function through his or her physical faculties alone but also through their psychological faculties as well. For the treatment of such faculties, an outsider support namely family support is required since the family is the closest group of people to the addicts. Social support thus is defined as aid forwarded to others to reduce stress, enabling stress management. Family members serve as source of support in helping addicts to have control over themselves and their surroundings.

Family support is dispensed through a myriad of aspects which may vary in different families. The common forms of support comprise unconditional acceptance, keenness to share problems (including being a good listener), sharing credible information, omitting negligence and stigma as well as a willingness to help the addicts overcome their addiction problem. Nevertheless, there are many other forms of support that can be given by families in dealing with opiate threats to the family.

To determine the questions that have to be focused on, a multivariate analysis was applied to identify the pattern of answers given by the respondents which could determine the importance of the question which gives a view on family support. The multivariate analysis has been applied in various fields and has been proven to help in analyzing large datasets efficiently [4]. For this study, a principal component analysis was applied to check the variation of questionnaires followed by a hierarchical agglomerative cluster analysis for the grouping of the types of questionnaire according to the hierarchy of variation. Both of these analyses help in the interpretation of the data [5]. Hence, this research has been conducted to

observe the most significant forms of support in various aspects as offered by families of opiate dependents in Terengganu through analyzing the questions using a multivariate analysis.

2. METHODOLOGY

2.1. Research Instrument

This study utilizes a questionnaire as an instrument for data collection. The questionnaire consists of two parts namely part A which is for the respondent's socio-demographic background, and part B which is for the forms of support and hindrances to support as suffered by the families. Part A comprises 13 items whilst part B has 95 items.

Items listed in part B are constructed based on a literature review upon recognizing four indicators for family support vis-à-vis five indicators for hindrances to such support. According to [6], social support is given in the form of emotional, information and instrumental support. It insists that the religious aspect is within information support. Yet, this research insists that the religious aspect ought to be a form of support on its own due to the nature of religion being pivotal in helping to improve addicts' self-abstinence while in rehabilitation programs, even though not much research has highlighted this [7]. Hence, the stipulated social support indicators are emotional, instrumental, information and spiritual. Every indicator has three dimensions to elaborate further on the indicator itself. Hindrances to family support include five indicators which are interaction, negligence, emotional, information and stigma. Table 1 displays the support indicators and their dimensions as well as the hindrance indicators.

Table 1. Support indicators and hindrance

Family Support		Restrain to Support
Indicator	**Dimension**	**Indicator**
Emotional	Acceptance	Interaction
	Involvement	Negligence
	Acknowledgment	Emotional
	Socialization	Information
Instrumental	Training and Job	Stigma
	Financial	
	knowledge	
Information	Manual	
	Advice and Guidance	
	Religious Awareness	
Spiritual	Religious Practices	
	Restriction and Punishment	

2.2. Measuring

This survey employs a semantic differential scale, which is applicable for measuring the attitudes or opinions of subject matters as shown in Fig. 1. The numbers are sorted in ascending order and numbers closer to 10 indicate a more positive answer being given.

(Highly disagree) 1 2 3 4 5 6 7 8 9 10 (highly agree)

Fig.1. Scale for measuring subject matter

2.3. Instrument Authentication

Before the exact research is conducted, a pilot test was done to determine the characteristics of questions that need to be modified or maintained [8]. The pilot test was a survey done on a small scale as a preparation before the real survey [9]. The pilot test was conducted on 32 respondents who possessed similar characteristics with the real samples. Accumulation of instrument validation involves applying the Cronbach's alpha test onto 32 surveys. The Cronbach's alpha for this study was 0.896 which is of significant validity for further analysis.

2.4. Sampling

The result of the pilot test proved that the items of the questionnaire had high reliability and were suitable for conducting a study. Hence, this study was carried out in Terengganu using a purposive sampling method. A total of 200 respondents were selected in which the respondent's criteria were based on their ability to respond to questions and relay information effectively to the researcher. Data was gathered from 200 respondents using questionnaires. The questionnaires were read to family members and marked by the researcher.

2.5. Data Analysis

Data analysis via statistical analysis was conducted using SPSS software version 20.0, and a further analysis of the multivariate analysis was undertaken with Microsoft excel (XLSTAT). The most common methods of multivariate analysis used in this study was the principal component analysis (PCA) and the hierarchical agglomerative cluster analysis (HACA) which are unbiased methods, indicating the association between all variables [10]. For this study, only the family support part will be analyzed regardless of the hindrance of support part.

2.5.1. Principal Component Analysis (PCA)

PCA is a method which allows the association between the variables to be traced, thus reducing the dimensionally of the data table [10]. PCA was used in this study to provide the information which had the most variation in their questions. The PCA can be expressed as:

$$z_{ij} = \alpha_{i1} x_{1j} + \alpha_{i2} x_{2j} + \cdots + \alpha_{im} x_{mj} \quad (1)$$

where z is the component score, α is the component loading, x is the measured value of the variable, i is the component number, j is the sample number and m is the total number of variables [11]. In the PCA, a varimax rotation was conducted, allowing for the "cleaning up" of the principle component (PC) by increasing the participation of the variables with higher contribution and simultaneously reducing the variables having a lower contribution [10]. The PCA is a powerful technique to identify the variation of each question in a set of questions and transforming it into a smaller set of independent variables (question) [12].

In this study, PCA was applied to the data set (70 variables) to identify the most significant question among the 70 questions which had significant value. Before the PCA was performed, the KMO value and Barlett's test should be determined where the KMO value must be more

than 0.5 in order to indicate that the PCA may be useful [13]. This is further reduced for a less significant PC through a varimax rotation according to an eigenvalue of more than 1 [4]. Only component loadings with an absolute value of higher than 0.75 were considered to be part of further investigations which are considered strong loading, as stated by [14-15]. The factor loadings were classified as strong (> 0.75), moderate (0.75-0.50) and weak (0.5-0.30).

2.5.2. Hierarchical Agglomerative Cluster Analysis (HACA)

HACA was employed to investigate the grouping of type of questions after the PCA analysis was done. HACA groups objects based on similarities within groups and dissimilarities of other groups based on their characteristics [16]. This method will classify the questions which have similarities within a group after the PCA was done. The approach used in this cluster analysis is hierarchical and agglomerative clustering to provide an intuitive similarity between the entire samples, as illustrated by a dendogram [17].

In this study, a cluster analysis was performed on the data by means of the Ward's method using squared Euclidean distances as a measure of similarity. The variability of questions was determined from HACA using the linkage distance, reported as $D_{link/}\, D_{max}$, as a measure of similarities between two samples and distance can be represented in a very efficient method [11,18].

3. RESULTS AND DISCUSSION

3.1 Socio-Demographic Status

A total of 200 respondents were enrolled as subjects for this study. All of the respondents were Malays (100%) and Muslim. More than half of the sample respondents (71%) were female. Their ages ranged from 15 to 80 years old with a mean age of 46.71. The majority (52.50%) of the respondents were more than 50 years old only a few of them had dropped out of school. The respondents were from the states of Johor (1.5%), Pahang (4%), Kelantan (8%) and Terengganu (86.50%). Table 2 shows their socio-demographic characteristics. Most of the respondents are self-employed, usually doing village work such as doing business on a small scale or farming with no fixed income, and usually having a low income of not more than RM2000 per month.

Table 2. Socio-demography characteristics

Characteristic	(N)	(%)	Characteristic	(N)	(%)
No of Household			Type of Occupation		
None	0	0	Government	13	6.5
1-2	29	14.5	Private	16	8
3-4	53	26.5	Self-Worker	48	24.00
5-6	56	28.00	Retired	2	1.00
7-8	31	15.50	Others	18	9.00
9-10	22	11.00	No Answer	97	48.50
11-12	9	4.50			
Marital Status			Occupation		
Married	153	76.5	Employed	72	36.00
Single	19	9.50	Unemployed	128	64.00
Divorce	4	2.00			
Widow	16	8.00			
No Answer	8	4.00			
Relationship			Income (Respondent)		
Mother	56	28.00	< RM500.00	26	13.00
Father	33	16.50	RM501-RM1000	36	18.00
Wife	30	15.00	RM1001-RM1500	11	5.50
Sibling	77	38.5	RM1501-RM2000	15	7.50
Grandfather	1	0.5	RM2001 Above	19	9.50
Grandmother	1	0.5	No Answer	93	46.50
Child	2	1.00			
Education			Income (Household)		
Dropout	6	3.00	< RM1000	78	39.00
Primary School	44	22.00	RM1001-RM2000	57	28.50
Secondary School	65	32.50	RM2001-RM3000	22	9.38
Higher Institution	8	4.00	RM3000-RM4000	12	11.00

Others	4	2.00	RM4001 above	14	7.00

3.2. Family Support Perception Source of Variation

In this study, the PCA was employed to identify the most probable variables (questions) which influenced family support after the KMO value accounted for more than 0.5 (0.80) and the Barlett's test was < 0.001. The analysis indicated based on 70 questions from analyzing the family support part that there were seven questions (independent variables), which have high variations. The result of the PCA based on the factor loading of the question after rotation including the loadings, the eigenvalues and cumulative variance is expressed in Table 3. As the eigenvectors classified the 70 variables into four groups, the first component (VF1) accounted for 14.08% of the total variance in the data set. The second component (VF2) accounted for 8.35% of the total variance. Meanwhile, VF3 and VF4 accounted for 8.44% and 8.21% respectively from the total variance. The strong loading value for each question is different according to their difference in variation. According to the result, these factors consist of questions 19, 6, 7 and 5 strong factor loading values respectively which approximately approached a value of 1.

Table 3. Loadings of seven high variation of questionnaire

Variable	VF1	VF2	VF3	VF4
Acceptance 3	0.2491	-0.0069	**0.6653**	0.0644
Social 1	**0.6022**	0.3061	0.1524	0.1078
T & E 1	0.2060	**0.6323**	0.0182	0.3249
Information 1	0.1590	0.0666	0.0644	**0.8070**
Information 2	0.1868	0.1666	0.1162	**0.8066**
Information 3	0.1350	0.0958	0.0348	**0.8689**
Information 4	0.1549	0.1107	0.0633	**0.8630**
Information 5	-0.1218	-0.0528	-0.0521	**-0.6804**
Guidance 4	**0.6076**	0.0554	0.0592	0.2386
Advice 1	0.2862	-0.1141	**0.6041**	0.1987
Religion Awareness 5	**0.6405**	0.0091	0.2234	-0.0088

Religion Awareness 6	**0.6180**	0.2564	0.0120	0.2035
Religion Awareness 8	**0.6160**	0.1464	0.1596	0.0729
Practical 2	0.7051	0.1755	0.2166	0.0860
Practical3	**0.8095**	0.0829	-0.0305	0.1628
Practical5	**0.7792**	-0.0559	0.1033	0.1568
Practical7	**0.6974**	-0.1915	0.2067	0.1099
Practical8	**0.7780**	-0.0029	-0.0512	0.1646
Practical9	**0.6098**	0.1152	0.2995	0.1538
Eigenvalue	16.351	4.659	3.402	2.948
Variability (%)	14.087	8.349	8.442	8.207
Cumulative %	14.087	22.437	30.878	39.085

*The bold ones represent strong loadings and the blue one representing moderate loading value

Based on Table 4, the value of those seven questions had a higher tendency to approach the value of 1 (> 0.75) which is considered a very strong loading value. These seven questions became focus questions because of the different answers given by the respondents that showed high variability. The high variation of answers given to these questions including the inconsistent answers, led to differences in the minimum and maximum values being high. This research showed that uneven answers were given based on the respondents' different socio-demographic backgrounds including education, religious beliefs, their background and their understanding towards drug problems [19]. Evidence showed that social support was influenced by several factors including socio economic and geographical area [20]. A detailed view of those strong loading values is shown in Fig. 2.

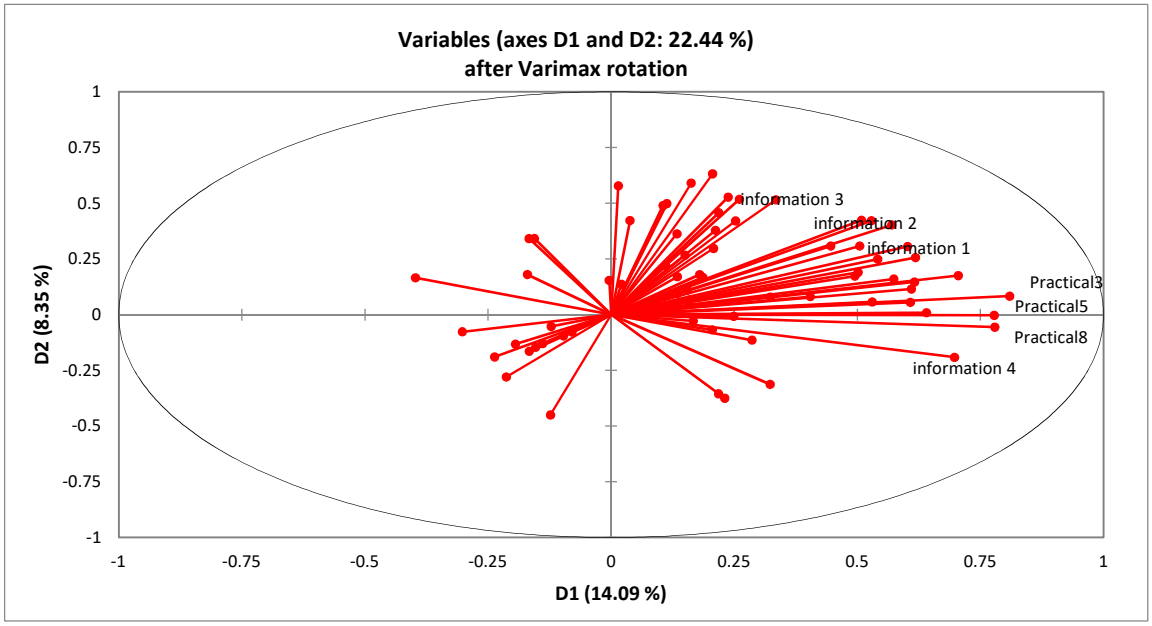

Fig.2. Questions which have a high tendency to approach value 1 (based on variables D1 and D2)

By the loading value set out in Table 4, there are seven variables (questions) that identify the classification of each variable proved by the correlation value. All the factors are named based on the loading value which is considered for further interpretation. Only VF1 and VF4 had strong loading values which were above 0.75. Therefore, we considered loading values above 0.6 for the interpretation of VF2 and VF3. The variables classified under VF1 are Practical 3, Practical 5 and Practical 8 which have a correlation value of 0.81, 0.78 and 0.78 respectively. All these classifications have their own characteristics, whereas the practical group classified questions that emphasized religious practices and their implementation in a drug addict's life as categorized under spiritual support. This shows the seriousness of the family in ensuring the opiate dependents perform religious duties in their daily life because they believe that religion can change them.

Some studies agree that spiritual support is a part of the process in drug rehabilitation [21]. This group was interpreted as being practical, since it shows a high loading on the religious practical aspect. The higher the score in this group, the higher the family support in the form of religious practice given by family members towards opiate dependents. While VF2 only has one moderate value which is 0.63, it is interpreted as training since it has moderate a value on the variable T&E 1. This factor indicates an effort by the family members to get training

skills for the opiate dependent. VF3 results in two variables in the range of the moderate loading value, combining two variables with different parts. These are acceptance 3 and advice 1 and these are named as encouragement. VF4 comprises information 1, information 2, information 3 and information 4 which have a correlation value of 0.81, 0.81, 0.87 and 0.87 respectively. This group was named information since the strong loading value on the information aspect indicates that the higher the score in this group, the higher the information collecting and sharing with the opiate dependent. The information group is about information support and is related to the efforts of the family members to obtain relevant information to be effectively delivered to drug addicts.

Together, these seven questions (Table 4) give a big impact in this study as they provide a very high correlation value, indicating the changing pattern of different answers by each respondent. The correlation value displays the real situation of the different views and responses to social perspectives in the study in which these questions have a great impact on the family itself in terms of acceptance of addicts to their involvement in efforts to help in the rehabilitation of drug addicts. Based on previous studies [22], family support and continuous involvement extended by them to help in the rehabilitation of opiate dependents is capable of sustaining recovery among opiate dependents. This is supported by [23] who states that families are very helpful in helping drug rehabilitation. Therefore, further studies to prove the classification obtained from the PCA was performed by a cluster analysis.

Table 4. Significant questions

No.	Significant Questions	Actual Questions
1	Practical 3	I am sure opiate dependent adding religious knowledge
2	Practical 5	I know opiate dependent getting close to “Allah”
3	Practical 8	I am sure opiate dependent joining a religious classes
4	Information 1	I try to find information on opiate dependent recovery
5	Information 2	I am keep abreast on information of opiate dependent recovery
6	Information 3	I am sharing information on recovery with opiate dependent
7	Information 4	I am discussing information on recovery with opiate dependent

3.3. Variation of Significant Questions

The basic statistics calculated for these questions (strong loading values) are summarized in the descriptive table (Table 5), which gives the range, mean and the standard deviation of the results for each of the seven that are highest in variation. Descriptive statistics were calculated to summarize the various aspects about the data, giving details about the data and providing information about the question from which the sample was drawn.

Table 5. Descriptive table for seven questions

Statistic	Practical3	Practical5	Practical8	Information 1	Information 2	Information 3	Information 4
No. of Observations	200	200	200	200	200	200	200
Minimum	1	1	1	1	1	1	1
Maximum	10	10	10	10	10	10	10
Range	9	9	9	9	9	9	9
1st Quartile	4	4	3	2	1.75	2	3
Median	7	7	6	6	5	5	5
3rd Quartile	8	8	8	8	7	7	7
Sum	1180	1193	1064	1053	950	998	1028
Mean	5.9	5.97	5.37	5.27	4.75	4.99	5.14
Variance (N-1)	8.02	6.91	7.38	8.61	8.3	7.81	7.54
Standard Deviation (N-1)	2.83	2.63	2.72	2.93	2.88	2.79	2.75

A box plot analysis (Fig. 3) was used in this analysis to define the range area and the number of respondents according to the divided subtheme. The reflection upon the disputes among the groups was achievable. All questions had high variation. However, the highest mean value was practical 5 (5.97). Fig. 3 shows the box plot which visualizes differences between each question. Information 2 shows the lowest mean value according to the answers given by respondents. Most of the answers given did not agree with this question and only a few

respondents agreed.

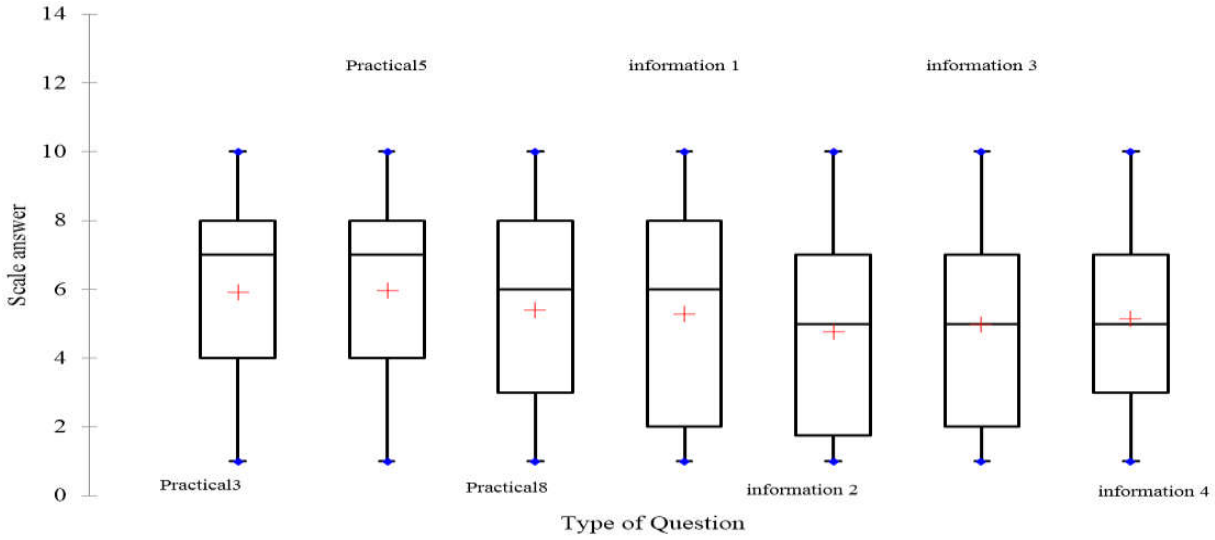

Fig.3. Scale answer variation: Religious awareness 6, religious awareness 10, control sentence 1, control sentence 2, information 3 and guidance 3

3.4. Determination Characteristics of Family Support

A cluster analysis was applied to the seven questions with high variability after the PCA was done, and the resulting dendogram by Ward's method is shown in Fig. 4. Seven questions were divided into three groups in a very convincing way that corresponded to low variation questions (LVQ), moderate variation questions (MVQ) and high variation questions (HVQ) respectively. The cluster analysis revealed different properties for each question with respect to the variation of the answer. The three groups vary according to their own characteristics.

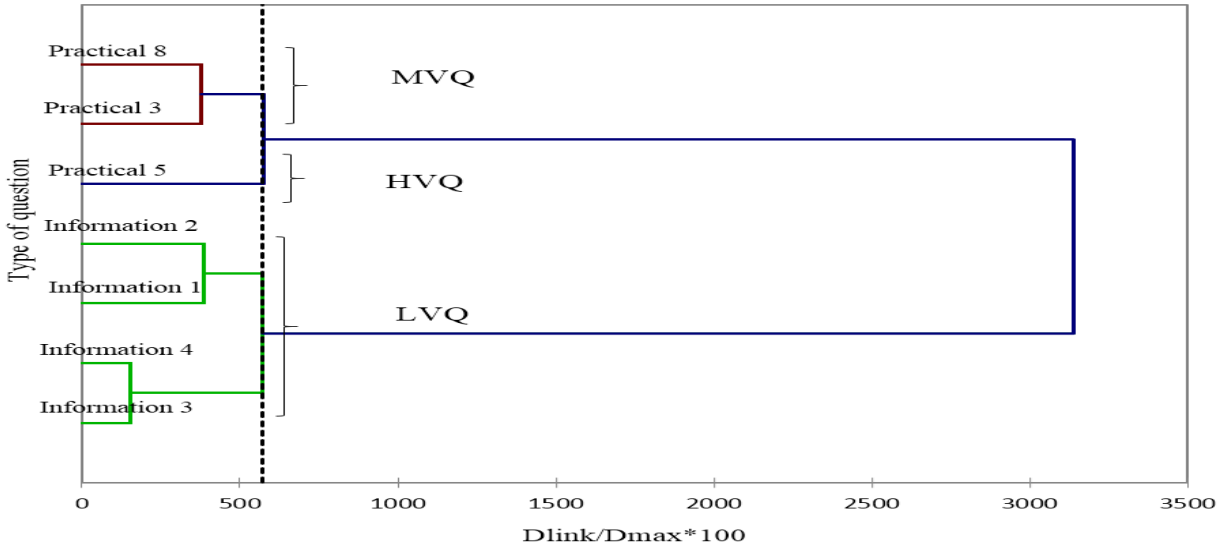

Fig.4. Dendogram based for agglomerative hierarchical clustering (wards method) based on the PCA scores

Cluster 1 only has two question on the religious practical part (practical 3 and 8). This cluster shows that families strictly ensuring that opiate dependents increase their religious understanding constitutes MVQ. Meanwhile, cluster 2 was categorized as HVQ which was differentiated with the practical religious aspect which was classified as practical 5 lonely. This question was in a separate group from the other two religious practical parts because of the difference in family knowledge on the religion of opiate dependents. Opiate dependents were not encouraged to practice the complimentary rites because of their disability to fulfil the obligatory rites. This practice was done to strengthen their dependency on religion. According to [7, 24-25], religion prevents the stress experienced by opiate dependents. However, the highest variation in this cluster showed that the strength of religion among respondents was very significant.

Cluster 3 (information 1, information 2 information 3 and information 4) have similar characteristics in information support which have questions with the lowest variation (LVQ). Cluster 3 isolated the questions that covered the endless attempts by family members to obtain more information relating to the opiate dependent, discussing obtained rehabilitation information with the opiate dependent and further explaining to them how to manage their daily routine to be much better. This cluster covered the questions about information support whereas family members got information on the rehabilitation process then tried to deliver the information efficiently to the opiate dependent. Sharing information with opiate dependents had a variation score influenced by family members' education level and area of residence. As a whole, our study revealed that the most significant questions giving impact to opiate dependents came from information support and spiritual support. Variations of the answers show that information of this problem and the understanding of religion among family members are multi-levelled. The variation of these seven item showing that they have different perspective and approaches on ensuring recovery of opiate dependent. Delivering information to opiate dependents to help their rehabilitation process is very important [26]. Family is named as the closest support network to opiate dependents and is characterized by strength of support, network characteristics and the types of support offered [27]. Religious knowledge is an important feature that needs to be owned by family members which may

influence opiate dependents in the recovery process.

4. CONCLUSION

This study demonstrated that multivariate data analysis methods are excellent tools in interpreting complex datasets. A complete set of questions has many questions that needed to be identified. Then, using the PCA, the high variation questions were identified as religious strength and information, indicating that family members gave attention towards the opiate dependent in spiritual and information aspects. Hence, further analysis by CA resulted in all these seven questions being grouped into three groups based on their similarities. In conclusion, this study identified the most significant questions which should be the focus of further investigation as the results of the questions have significant impact to the family members.

5. ACKNOWLEDGEMENTS

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