ASM Sc. J., 17, 2022

https://doi.org/10.32802/asmscj.2022.1289

Analysis of Risk Factors Affecting Suicidal Ideation among Public University Students in Malaysia using Analytic Hierarchy Process

Chan, S.Y.* and Ch'ng, C.K.

Department of Decision Science, School of Quantitative Sciences, Universiti Utara Malaysia, 06010 Sintok, Kedah, Malaysia

Suicide can be defined as an act of self-injury with the intent to die. According to World Health Organisation (WHO), it is estimated that more than 700 000 people end their life every year. Suicide becomes a critical social problem in recent years and it is one of the key reasons for death among university students. Generally, the prevalence of suicidal ideation among university students is ranged from 1.3% to 32.7% worldwide. Therefore, it is necessary to determine the risk factors for suicidal ideation among university students and rank them based on the significance level so that the students with these characteristics can be identified promptly and proper actions can be taken to help them. In this study, we had discovered 18 risk factors for suicidal ideation through systematic literature review and these factors were ranked based on the importance level using Analytic Hierarchy Process (AHP) method. As a result, we found that the most important factors that lead to suicidal ideation were prior suicide attempts, mental disorder and negative life events. In contrast, gender and residential area were the least important reasons for suicidal ideation. Thus, the implementation of AHP method enables us to compare various risk factors effectively.

Keywords: Analytic Hierarchy Process; Prioritising; Risk factors; Suicidal ideation

I. INTRODUCTION

Suicide can be described as an act of self-harm with the intent to die (Turecki & Brent, 2016). World Health Organisation (WHO) (2021) claimed that suicide is a severe social health problem worldwide. Generally, more than 700 000 people die by suicide every year. Suicide is one of the critical leading causes of death among people aged between 15 to 29.

Research stated that suicide is the second key reason for death among the university student population (Turecki & Brent, 2016). Overall, the prevalence of suicidal ideation among university students is ranged from 1.3% to 32.7% globally (Hirsch *et al.,* 2011).

In Malaysia, the tendency of university students in committing suicide is alarmingly high. It can be shown by the several suicide cases among university students that had reported recently. For example, a Chinese university student was found dead by hanging in her house (Liang, 2016). Another two students from Klang Valley-based university were reported committed suicide in the space of a week ("Private University Reels from Two Student Suicides", 2019). Besides that, a case that reported by Miri News (2021) involved the discovery of a female student in Sarawak who was found dead hanging from a towel in her bedroom ("Female University Student from Sibu Suicide by Hanging", 2021).

Undeniable, suicide is highly associated with several factors (Jusnani *et al.,* 2020). *Hopelessness* is among the factors that lead to suicidal ideation. People with feelings of *hopelessness* are more likely to lose passion for life and finally derive suicidal thoughts (Lyu & Zhang, 2019).

In addition, *mental disorder* problem is highly correlated to suicidal thoughts (Bilsen, 2018; Owusu-ansah *et al.,* 2020). *Mental disorder* problem such as depression, anxiety, eating disorders, sleeping disorder and many else are the key

*Corresponding author's e-mail: chansinyin97@gmail.com

contributors to suicide (Bilsen, 2018; Pillay, 2021; Mohd Shafiee & Mutalib, 2020).

Stress is also found as a key factor for suicidal ideation (Primananda & Keliat, 2019). Stressors for university students including academic stress, task overload, relationship problem, financial problem, lack of leisure time and so on probably cause mental health problem that results in suicidal thoughts (Jusnani *et. al.,* 2020; Pillay, 2021).

Research stated that people with *poor social support* are highly related to suicidal intentions (Abdu *et al.,* 2020). According to Jusnani *et al.* (2020), individuals who have *interpersonal conflicts* think that they are a burden to others. They perceived themselves as meaningless to others.

Society pressure is also a key factor that contributes to suicidal ideation. The student tends to feel stress when facing pressure from society such as peers, social media, lecturers, family and roommates in university (Jusnani *et al.,* 2020).

Another factor for suicidal ideation is *low self-esteem* as it makes a person always in the condition of upset and depressed. Ultimately, they tend to kill themselves during difficult time (Jusnani *et. al.,* 2020; Owusu-ansah *et al.,* 2020).

Family factors involving child abuse, parents with drugs and alcohol addiction, divorced family and poor relationships between family members are strongly correlated with suicidal behaviours among the youth (Costa *et. al.,* 2019; Abdu *et. al.,* 2020; Bilsen, 2018; Junior *et. al.,* 2020; Jusnani *et al.,* 2020).

People with *previous suicide attempts* are more likely to repeat the act of injuring themselves (Bilsen, 2018; Olfson, 2018). Nock *et al.* (2013) mentioned that one-third of the individuals with suicidal thoughts will develop a suicide plan.

According to Bilsen (2018) and Wasserman *et al.* (2021), some *personality characteristics* including unable to manage varied emotions well, poor problem-solving skills and so forth more likely to lead to the sense of insecurity, *low self-esteem*, emotional crisis and suicide. Besides, negative thought is also a risk factor for suicidal ideation (Pillay, 2021).

Bilsen (2018) mentioned that stressful situations can derive suicidal intention. *Negative life events* such as relationship problem, sexual abuse, cyberbullying, the death of friends or family members and etc., bring huge negative impact on young people.

The suicide news that frequently published on social media formed suicide clusters. It is due to the tendency of an individual to *imitate* someone who has similarity with them (Bilsen, 2018). This statement is agreed by Durkee *et al.* (2011) who said that internet and social media play a crucial part in promoting suicidal behaviours.

Based on Abdu *et al.* (2020), *gender* significantly affects the prevalence of people to have suicidal intentions. Some of the researchers declared that female is more likely to have suicidal ideation during the transformation phase from school to university (Mohd Shafiee & Mutalib, 2020; Arafat *et al.,* 2018). However, another group of researchers claimed that male is high risk for suicide because they have low courage to seek help from others (Amini *et. al.,* 2016; Park *et. al.,* 2020; Wasserman *et. al.,* 2021; Pillay, 2021).

Health problem is one of the important factors for suicidal ideation (Lyu & Zhang, 2019). A study concluded that individual who suffered from severe physical illness and disabilities appear to be more vulnerable to suicidal thoughts (Yu *et. al.,* 2021; Pillay, 2021).

Suicide thoughts are more vulnerable to people who are facing *financial problem* (Almaghrebi, 2021; Berkelmans *et. al.,* 2021; Mohd Shafiee & Mutalib, 2020). Lack of money to afford university costs and living costs increase the possibility of the students to be involved in suicide crisis (Jusnani *et al.,* 2020).

Substance abuse can be considered as an important contributor to suicidal ideation. Based on a study that conducted by Costa *et al.* (2019), the students who have smoking habits tend to commit suicide. Besides, lifetime alcohols and drugs use make a person at high risk for suicidal thoughts (Abdu *et. al.,* 2020; Junior *et al.,* 2020).

Religion is critical to help people reduce their stress and anxiety. Hence, involving in the religious activities more probably can reduce the tendency of people to have suicidal thoughts (Abdu *et al.,* 2020). Apart from that, suicide is strictly forbidden in almost all religions (Gearing & Alonzo, 2018; Nguyen *et al.,* 2020).

Residential area is also one of the factors that will influences the suicidal ideation. Suicide rate in rural areas was found higher than urban areas due to the lower availability of medical assistance and also the issues such as violence and substance abuse in rural areas that may lead to

mental illness and suicidal crisis (Junior *et. al.,* 2020; Yu *et al.,* 2021).

Multicriteria Decision Making approach (MCDM) is an operational research that utilised in decision making problem has big advantage in decision making problem by considering several criteria (Gebre *et al.,* 2021). There are several types of MCDM method that used to rank the alternatives such as Analytic Hierarchy Process (AHP), Analytic Network Process (ANP), Best-Worst Method (BWM), Technique for Order of Preference by Similarity to an Ideal Solution (TOPSIS), Data Envelopment Analysis (DEA), Simple Multiattribute Rating Technique (SMART) and Multi Attribute Utility Theory (MAUT) and Swing (Mohammadi & Rezaei, 2020; Dotoli *et al.,* 2020).

Some of the MCDM methods had been widely applied in psychiatry studies. For instance, the stress factors of policemen have been sorted hierarchically in Turkey using AHP (Öneren *et al.,* 2016). Besides that, Fuzzy Delphi method (FDM) and Fuzzy Analytical Hierarchy process (FAHP) had also been implemented to determine the firefighter's stress (Rajabi *et al.,* 2020). During the COVID-19 pandemic, the stress factors for online distance learning among university students had also been analysed using Fuzzy ANP (Hisham *et al.,* 2021). Not only that, an analysis of stress intensity in the urban areas of India during the covid-19 outbreak had also been investigated using TOPSIS (Gupta *et al.,* 2021).

II. MATERIALS AND METHODS

A. Data Collection

Primary data was collected through a questionnaire in this study. The questionnaire required the respondents to rank the importance of the risk factor in relation to other factors. In this study, university students in Malaysia were chosen as the respondents due to the fact that university students carried a high risk of suicide attempts (Pillay, 2021). However, the previous studies about suicide attempts among university students in Malaysia are still scarce. Hence, suicide attempts among these university students need to be investigated further in order to uncover the potential factors that lead to this issue. The questionnaire was distributed to the public university students in Malaysia from different states through online Google Forms. The measurement scale used are likert scale which range from 1 to 5. Simple random sampling method were implemented in choosing the sample for the research. A total of 35 samples were taken.

A. Method

Analytic hierarchy process (AHP) is one of the MCDM techniques that is used to determine the relative importance of numerous variables throughout the decision-making process. The reason of choosing AHP technique are its usability in various fields and it is the simplest method that used to rank several alternatives (Karthikeyan *et al.,* 2019). AHP is employed in various fields such as construction, health, logistic, education, and many more (Unver & Ergenc, 2021). Apart from that, it is the most common method that is widely used in health areas (Sodhro *et. al.,* 2017; Huang *et. al.,* 2018; Improta *et. al.,* 2019; Aslan, 2021).

The AHP algorithms are as follows:

Step 1: List all the variables extracted from the literature

In this study, there are 18 variables have been uncovered which are hopelessness, mental disorder, substance *abuse, stress, previous suicide attempts, family factor, poor social support, negative life events, personality characteristic, health problem, low self-esteem, residential area, gender, imitation, society pressure, financial problem, religion* and *interpersonal conflicts*. The factors are determined through systematic literature review.

Step 2: Develop a pairwise comparison matrix

The paired comparisons are conducted by using a scale of 1 to 5 to determine the importance level of each factor compared to the other factors. The respondents are required to select the preferred scale for each factor. Table 1 shows the preference scale value that ranges from 1 to 5.

Table 1. AHP Scale

Important level	Value
Equally important	1
Moderately important	2
Strongly important	3
Very strongly important	4
Extremely important	5

Step 3: Develop a normalised matrix

To normalise each variable, each number in the table needs to be divided by the sum of the numbers of that column.

Step 4: Rank the variables

Values obtained by multiplying the criteria and options are arranged based on the order of value which is the option priority.

Step 5: Examine Consistency Ratio (CR)

In this step, the consistency degree is calculated to test the validity and reaction consistency.

Consistency index formula as follows:

$$CI = \frac{Average\ Value - n}{n - 1}$$

where n = the number of decision alternatives being compared

Average value = the average computed previously

Consistency ratio formula:

$$CR = \frac{CI}{RI}$$

where RI= Random index

Table 2. Random Index (RI)

N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48	1.56	1.57	1.58

If the consistency index (CI) is zero, then the comparison would be perfectly consistent. In contrast, if CI is not equal to zero, so there exists some inconsistency. If CI value less than 0.1 means that the data is acceptable for analysis. For consistency ratio (CR) value, if it is less than 0.1 means that the data is reliable.

III. RESULTS AND DISCUSSION

This section presents the demographic of the samples and analysis results for the AHP method which is implemented to rank the 18 suicidal factors among university students.

A. Demographic Description of the Sample

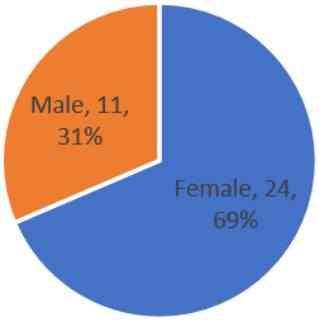

Figure 1. Gender distribution of sample

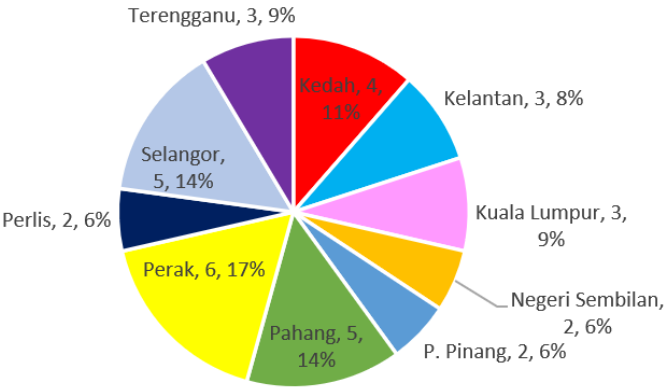

Figure 2. State distribution of sample

A total of 35 respondents had been studied in this research. The percentage of the female samples (69%) is approximately twice higher than the male samples (31%) respectively. The respondents are selected from different states of Malaysia such as Terengganu (9%), Kedah (11%), Kelantan (8%), Kuala Lumpur (9%), Selangor (14%), Perlis (6%), Perak (17%), Pahang (14%), Pulau Pinang (6%), Negeri Sembilan (6%), Kuala Lumpur (9%) and Kelantan (8%) that had covered most of the states in Peninsular Malaysia.

B. AHP Result

This section presents the ranking results of 18 factors using AHP method. The risk factors involve *hopelessness, mental disorder, substance abuse, stress, previous suicide attempts, family factor, poor social support, negative life events, personality characteristic, health problem, low self-esteem, residential area, gender, imitation, society pressure, financial problem, religion* and *interpersonal conflicts.*

Table 3. Pairwise Comparison Matrix

Factors	Hopelessness	MD	Stress	SA	FF	Religion	PSS	PSA	PC	NLE	Imitation	HP	IC	SP	FP	LSE	Gender	RA
Hopelessness	1.0000	0.9766	1.2370	0.7750	1.0694	0.8239	1.0501	0.6430	0.8862	0.8325	1.2294	0.8234	0.8604	0.9070	0.8310	1.0865	1.4554	1.4891
MD	1.0240	1.0000	1.2186	1.2737	0.9491	1.2401	1.4128	0.9230	1.4984	0.9719	1.2333	1.1917	1.3342	1.0038	1.1595	1.3414	1.8025	1.7983
Stress	0.8084	0.8206	1.0000	1.3825	1.1886	1.4955	1.1191	0.7680	1.0763	0.8520	1.4613	1.0935	1.0161	1.0626	1.0114	1.2446	1.7000	1.6050
SA	1.2903	0.7851	0.7233	1.0000	0.8578	1.5011	1.1328	0.8265	1.2400	0.7513	1.5707	1.0601	1.0809	0.9504	0.7552	1.1252	2.0517	1.7981
FF	0.9351	1.0536	0.8413	1.1658	1.0000	1.3799	1.5708	0.7792	0.9651	0.9798	1.3679	1.0019	1.1150	1.4063	0.8749	1.1015	1.6390	1.7808
Religion	1.2137	0.8064	0.6687	0.6662	0.7247	1.0000	0.9313	0.6489	0.7705	0.7039	1.2389	0.7757	0.7058	0.8320	0.7248	0.7261	1.1720	1.2520
PSS	0.9523	0.7078	0.8936	0.8828	0.6366	1.0738	1.0000	0.8908	0.9648	0.6935	1.4047	0.8448	1.0639	0.9033	0.7252	0.9545	1.6356	1.6497
PSA	1.5552	1.0834	1.3021	1.2100	1.2833	1.5411	1.1226	1.0000	1.7523	1.7237	1.5041	1.4261	1.8145	1.5716	1.2584	1.2737	1.9966	1.9637
PC	1.1285	0.6674	0.9291	0.8064	1.0362	1.2978	1.0365	0.5707	1.0000	0.9117	1.5867	1.0170	1.1112	1.1076	0.9610	1.0799	1.4466	1.5798
NLE	1.2011	1.0289	1.1737	1.3311	1.0206	1.4206	1.4420	0.5801	1.0969	1.0000	1.5399	1.2176	1.0905	1.0465	1.1359	0.9474	2.0749	1.8036
Imitation	0.8134	0.8108	0.6843	0.6367	0.7310	0.8071	0.7119	0.6649	0.6302	0.6494	1.0000	0.8415	0.9038	0.6663	0.7030	0.7956	1.2663	1.2807
HP	1.2144	0.8392	0.9145	0.9433	0.9981	1.2891	1.1837	0.7012	0.9833	0.8213	1.1884	1.0000	1.4992	1.0648	1.0298	0.9621	1.8075	1.5460
IC	1.1623	0.7495	0.9842	0.9252	0.8969	1.4168	0.9400	0.5511	0.8999	0.9170	1.1064	0.6670	1.0000	0.8157	0.8195	1.1035	1.5958	1.6744
SP	1.1026	0.9962	0.9411	1.0522	0.7111	1.2019	1.1071	0.6363	0.9029	0.9555	1.5008	0.9391	1.2260	1.0000	0.7990	1.0949	1.6129	2.1679
FP	1.2033	0.8625	0.9888	1.3242	1.1429	1.3797	1.3789	0.7947	1.0406	0.8803	1.4224	0.9710	1.2202	1.2515	1.0000	1.1746	1.4239	1.5653
LSE	0.9204	0.7455	0.8035	0.8887	0.9078	1.3773	1.0477	0.7851	0.9260	1.0556	1.2570	1.0394	0.9062	0.9134	0.8514	1.0000	1.5416	1.7812
Gender	0.6871	0.5548	0.5882	0.4874	0.6101	0.8532	0.6114	0.5008	0.6913	0.4820	0.7897	0.5532	0.6267	0.6200	0.7023	0.6487	1.0000	1.0410
RA	0.6715	0.5561	0.6230	0.5561	0.5615	0.7987	0.6062	0.5092	0.6330	0.5545	0.7808	0.6468	0.5972	0.4613	0.6389	0.5614	0.9606	1.0000

Table 4. Normalised Matrix

Factors	Hopelessness	MD	Stress	SA	FF	Religion	PSS	PSA	PC	NLE	Imitation	HP	IC	SP	FP	LSE	Gender	RA
Hopelessness	0.0530	0.0649	0.0749	0.0448	0.0655	0.0376	0.0541	0.0503	0.0493	0.0529	0.0530	0.0481	0.0449	0.0516	0.0520	0.0596	0.0516	0.0517
MD	0.0542	0.0665	0.0738	0.0736	0.0581	0.0566	0.0728	0.0723	0.0834	0.0618	0.0532	0.0696	0.0696	0.0571	0.0726	0.0736	0.0640	0.0625
Stress	0.0428	0.0545	0.0606	0.0799	0.0728	0.0683	0.0577	0.0601	0.0599	0.0541	0.0630	0.0639	0.0530	0.0604	0.0633	0.0683	0.0603	0.0558
SA	0.0683	0.0522	0.0438	0.0578	0.0525	0.0685	0.0584	0.0647	0.0691	0.0477	0.0678	0.0620	0.0564	0.0540	0.0473	0.0618	0.0728	0.0625
FF	0.0495	0.0700	0.0509	0.0674	0.0613	0.0630	0.0809	0.0610	0.0537	0.0623	0.0590	0.0586	0.0582	0.0800	0.0547	0.0605	0.0582	0.0619
Religion	0.0643	0.0536	0.0405	0.0385	0.0444	0.0457	0.0480	0.0508	0.0429	0.0447	0.0534	0.0453	0.0368	0.0473	0.0454	0.0398	0.0416	0.0435
PSS	0.0504	0.0470	0.0541	0.0510	0.0390	0.0490	0.0515	0.0697	0.0537	0.0441	0.0606	0.0494	0.0555	0.0514	0.0454	0.0524	0.0580	0.0573
PSA	0.0824	0.0720	0.0788	0.0699	0.0786	0.0704	0.0579	0.0783	0.0976	0.1095	0.0649	0.0833	0.0946	0.0894	0.0787	0.0699	0.0708	0.0682
PC	0.0598	0.0444	0.0563	0.0466	0.0635	0.0593	0.0534	0.0447	0.0557	0.0579	0.0684	0.0594	0.0580	0.0630	0.0601	0.0593	0.0513	0.0549
NLE	0.0636	0.0684	0.0711	0.0769	0.0625	0.0649	0.0743	0.0454	0.0611	0.0635	0.0664	0.0712	0.0569	0.0595	0.0711	0.0520	0.0736	0.0627
Imitation	0.0431	0.0539	0.0414	0.0368	0.0448	0.0369	0.0367	0.0520	0.0351	0.0413	0.0431	0.0492	0.0471	0.0379	0.0440	0.0437	0.0449	0.0445
HP	0.0643	0.0558	0.0554	0.0545	0.0611	0.0589	0.0610	0.0549	0.0548	0.0522	0.0513	0.0584	0.0782	0.0606	0.0644	0.0528	0.0641	0.0537
IC	0.0616	0.0498	0.0596	0.0535	0.0549	0.0647	0.0484	0.0431	0.0501	0.0583	0.0477	0.0390	0.0522	0.0464	0.0513	0.0606	0.0566	0.0582
SP	0.0584	0.0662	0.0570	0.0608	0.0436	0.0549	0.0571	0.0498	0.0503	0.0607	0.0647	0.0549	0.0639	0.0569	0.0500	0.0601	0.0572	0.0753
FP	0.0637	0.0573	0.0599	0.0765	0.0700	0.0630	0.0711	0.0622	0.0579	0.0559	0.0614	0.0568	0.0636	0.0712	0.0626	0.0645	0.0505	0.0544
LSE	0.0487	0.0496	0.0487	0.0513	0.0556	0.0629	0.0540	0.0615	0.0516	0.0671	0.0542	0.0607	0.0473	0.0519	0.0533	0.0549	0.0547	0.0619
Gender	0.0364	0.0369	0.0356	0.0282	0.0374	0.0390	0.0315	0.0392	0.0385	0.0306	0.0341	0.0323	0.0327	0.0353	0.0439	0.0356	0.0355	0.0362
RA	0.0356	0.0370	0.0377	0.0321	0.0344	0.0365	0.0312	0.0399	0.0352	0.0352	0.0337	0.0378	0.0312	0.0262	0.0400	0.0308	0.0341	0.0348

The pairwise comparison matrix for all factors is displayed in Table 3. Then, each value in the pairwise comparison matrix is divided by the corresponding column total in order to normalise the values (refer to Table 4).

Table 5. Ranking of factors

Factors	Weights	Ranking
PSA	0.0786	1
MD	0.0664	2
NLE	0.0647	3
FP	0.0624	4
FF	0.0617	5
Stress	0.0610	6
SA	0.0593	7
HP	0.0587	8
SP	0.0579	9
PC	0.0564	10
LSE	0.0550	11
Hopelessness	0.0533	12
IC	0.0531	13
PSS	0.0522	14
Religion	0.0459	15
Imitation	0.0431	16
Gender	0.0355	17
RA	0.0346	18

After that, the priority values for the factors are found by calculating the average for each row. Finally, the factors are sorted from the highest weights to the lowest weights.

The consistency index (CI) and consistency ratio (CR) values are 0.0081 and 0.0051, respectively which are less than 0.1. Thus, it can be said that the data is reliable and accepted for analysis.

C. Discussion

In this study, overall risk factors of suicidal ideation were prioritised and sorted based on the preferences using AHP method. Based on the result in Table 5, it can be concluded that the main risk factor for suicidal ideation is *prior suicide attempts*. With the value of 0.0786 followed by *mental disorder* (0.0664), *negative life events* (0.0647), *financial problem* (0.0624), *family factor* (0.0617). Conversely, the least contributed factors are gender and residential area with only approximately 0.35.

Previous suicide attempts is considered as the most significant contributor to suicidal ideation because people who had harmed themselves before tend to repeat the same actions in the future if they do not receive immediate help during their first attempt. Individuals with *previous suicide attempts* are vulnerable to ongoing suicidal behaviours.

Mental disorder is also a key factor for suicidal ideation. Most of the suicides are highly related with psychiatric diseases especially depression, anxiety, psychosis and substance use disorder. University students are the high risk group for *mental disorder* problem since they have to cope with various problem in university such as academic problem, relationship problem, financial problem and etc.

Apart from that, *negative life events* also lead to suicidal ideation. This is due to psychiatric diseases may stem from *negative life events* such as relationship problem, financial problem, health problem and many more. People opt to have serious suicidal thoughts when they face the huge obstacles in their life.

However, *gender* and *residential area* are the less important factors for suicidal ideation. It can be said that *gender* and *residential area* are not critical in causing the suicidal thoughts among university students.

Generally, more attention should be paid to the students who have the characteristics as they are the person at high risk of suicidal ideation. Government, parents and any related authorities should discover the symptoms earlier and take immediate actions such as organising intervention programs and advising them to seek for help from mental health experts or any trustable person in order to help the students who are suffering from suicidal thoughts.

IV. CONCLUSION

This paper aims to figure out the seriousness of the risk factors in suicide cases according to their level of seriousness. The implementation of AHP method enables the comparison among various risk factors for suicidal ideation. Suicide is a relatively rare event and it is hard to accurately predict which persons with these risk factors will ultimately commit suicide. However, by discovering the risk factors based on the level of seriousness enable the society or government to have an early

awareness hence producing effective strategies such as prevention program, helpline and treatment to the university students in order to minimise the impact of this issue. Reducing the suicide rates among university students not only can maintain the reputation of the university but can also create a healthy learning environment for the students.

Future work can be done by ranking the 18 factors using other MCDM methods and comparing the results to identify the best ranking method for the problem. These factors can also be used to develop the prediction model for suicidal ideation to evaluate the relationship between the factors and suicidal ideation. Besides, the AHP method that utilised in this paper can be referred and applied on other aspects following the steps in this paper. The priority values can be obtained easily with the simple steps, low cost for data collecting process and without any bias.

V. ACKNOWLEDGEMENT

I would like to express my sincere gratitude to School of Quantitative Sciences, Universiti Utara Malaysia (UUM) for providing the facilities and their consistent encouragement, motivation and assistance.

VI. CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

VII. REFERENCES

Abdu, Z, Hajure, M & Desalegn, D 2020, 'Suicidal behavior and associated factors among students in Mettu University, South West Ethiopia, 2019: An institutional based cross-sectional study', Psychology Research And Behavior Management, vol. 13, pp. 233–243. doi: 10.2147/PRBM.S240827

Almaghrebi, AH 2021, 'Risk factors for attempting suicide during the COVID-19 lockdown: Identification of the high-risk groups', Journal of Taibah University Medical Sciences, vol. 16, no. 4, pp. 605-611. doi: 10.1016/j.jtumed.2021.04.010

Amini, P, Ahmadinia, H, Poorolajal, J & Moqaddasi Amiri, M 2016, 'Evaluating the high risk groups for suicide: a comparison of logistic regression, support vector machine, decision tree and artificial neural network', Iranian Journal Of Public Health, vol. 45, no. 9, pp. 1179–1187. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5149472/

Arafat, SMY, Mali, B & Akter, H 2018, 'Demography and risk factors of suicidal behavior in Bangladesh: A retrospective online news content analysis', Asian Journal of Psychiatry, vol. 36, pp. 96–99. doi: 10.1016/j.ajp.2018.07.008

Aslan, I 2021, 'Ranking and comparing occupational health and safety system performance indicators in hospitals by Analytic Hierarchy Process (AHP)', International Journal of Occupational Safety and Ergonomics, (just-accepted), pp. 1-24. doi: org/10.1080/10803548.2021.1943167

Berkelmans, G, Van der Mei, R, Bhulai, S & Gilissen, R 2021, 'Identifying socio-demographic risk factors for suicide using data on an individual level', BMC Public Health, vol. 21, no. 1. doi: org/10.1186/s12889-021-11743-3

Bilsen J 2018, 'Suicide and youth: Risk Factors', Frontiers in Psychiatry, vol. 9, pp. 540. doi: 10.3389/fpsyt.2018.00540

Costa, ACB, Mariusso, LM, Canassa, TC, Previdelli, ITS & Porcu, M 2019, 'Risk factors for suicidal behavior in a university population in Brazil: a retrospective study', Psychiatry Research, vol. 278, pp. 129–134. doi: 10.1016/j.psychres.2019.05.039

Dotoli, M, Epicoco, N & Falagario, M 2020, 'Multi-Criteria Decision Making techniques for the management of public procurement tenders: A case study', Applied Soft Computing, vol. 88, p. 106064. doi: 10.1016/j.asoc.2020.106064

Durkee, T, Hadlaczky, G, Westerlund, M & Carli, V 2011, 'Internet pathways in suicidality: A review of the evidence', International Journal of Environmental Research and Public Health, vol. 8, no. 10, pp. 3938-3952. doi: 10.3390/ijerph8103938

诗巫女大学生疑上网课太压力而上吊自杀 [Female university student from Sibu suicide by hanging due to online class

pressure]. (2021, January 9). *Miri News*. https://imedia.my/?p=515&fbclid=IwAR2YtSI5QPryJo6oCKMa 5254eg7pCcb8jJw9d_zhQpYZo5SsoQVyYOPu2Ks

Gearing, RE & Alonzo, D 2018, 'Religion and suicide: new findings', J Relig Health, vol. 57, pp. 2478–2499. doi: 10.1007/s10943-018-0629-8

Gebre, SL, Cattrysse, D, Alemayehu, E & Orshoven, JV 2021, 'Multi-criteria decision making methods to address rural land allocation problems: A systematic review', International Soil and Water Conservation Research, vol. 9, no. 4, pp. 490-501. doi: 10.1016/j.iswcr.2021.04.005

Gupta, S, Vijayvargy, L & Gupta, K 2021, 'Assessment of stress level in urban area's during COVID-19 outbreak using critic and topsis: A case of Indian cities', Journal of Statistics and Management Systems, vol. 24, no. 2, pp. 411-433. doi: 10.1080/09720510.2021.1879470

Hirsch, JK, Webb, JR & Jeglic, EL 2011, 'Forgiveness, depression, and suicidal behavior among a diverse sample of college students', J Clin Psychol., vol. 67, no. 9, pp. 896–906. doi: 10.1002/jclp.20812

Hisham, SFSH, Ahmad, N, Yusof, ZM & Aini, HN 2021, 'An application of fuzzy ANP in evaluating stress factors among university's students during online distance learning', Journal of Physics: Conference Series 2084(1), p. 012014. https://iopscience.iop.org/article/10.1088/17426596/2084/1/012014/meta

Huang, YP, Basanta, H, Kuo, HC & Huang, A 2018, 'Health symptom checking system for elderly people using fuzzy analytic hierarchy process', Applied System Innovation, vol. 1, no. 2, p. 10. doi: 10.3390/asi1020010

Improta, G, Perrone, A, Russo, MA & Triassi, M 2019, 'Health technology assessment (HTA) of optoelectronic biosensors for oncology by analytic hierarchy process (AHP) and Likert scale', BMC Medical Research Methodology, vol. 19, no. 1, pp. 1-14. doi: 10.1186/s12874-019-0775-z

Júnior, AR, Fletes, J, Lemos, T, Teixeira, E & Souza, M 2020, 'Risk factors for suicide: systematic review', Saudi Journal for Health Sciences, vol. 9, p. 183. doi: 10.4103/sjhs.sjhs_83_20. https://www.saudijhealthsci.org/text.asp?2020/9/3/183/302448

Jusnani, E, Salmah, MY & Razali, MO 2020, 'Exploration on perceptions of suicidal ideation among students of higher education', Journal of Cognitive Sciences and Human Development, vol. 6, no. 2, pp. 31-51. doi: 10.33736/jcshd.1939.2020

Liang, Y 2016, *大马华裔大学生疑因学业压力自杀无法过22岁生日* [Chinese university student in Malaysia suspected of committing suicide due to academic pressure before her 22nd birthday]. *Chinaqw*. http://www.chinaqw.com/hqhr/2016/11-11/112381.shtml

Karthikeyan, R, Venkatesan, K & Chandrasekar, A 2019, 'A comparison of strengths and weaknesses for analytical hierarchy process', Journal of Chemical and Pharmaceutical Sciences, vol. 9, no. 3. S-12-S-15. https://www.researchgate.net/publication/331589050_A_Comparison_of_Strengths_and_Weaknesses_for_Analytical_Hierarchy_Process

Lyu, J & Zhang, J 2019, 'BP neural network prediction model for suicide attempt among Chinese rural residents', Journal of Affective Disorders, vol. 246, pp. 465–473. doi: 10.1016/j.jad.2018.12.111

Mohammadi, M & Rezaei, J 2020, 'Ensemble ranking: Aggregation of rankings produced by different multi-criteria decision-making methods', Omega, p. 102254. doi: 10.1016/j.omega.2020.102254

Mohd Shafiee, S & Mutalib, S 2020, 'Prediction of mental health problems among higher education student using machine learning', International Journal of Education and Management Engineering (IJEME), vol. 10, no. 6, pp. 1-9. doi: 10.5815/ijeme.2020.06.01

Nguyen, M, Cabral, MD & Patel, DR 2020, 'Suicide in adolescents: Exploring the role of religion', International Journal of Child Health and Human Development, vol. 13, no. 4, pp. 379-382. https://www.proquest.com/openview/2c2b1127b368c28ec856d269c96cc258/1?pqorigsite=gscholar&cbl=2034871

Nock, MK, Green, JG, Hwang, I, McLaughlin, KA, Sampson, NA, Zaslavsky, AM & Kessler, RC 2013, 'Prevalence, correlates, and treatment of lifetime suicidal behavior among adolescents: Results from the national comorbidity survey replication adolescent supplement', JAMA Psychiatry, vol. 70, no. 3, pp. 300-310. doi: 10.1001/2013.jamapsychiatry.55

Olfson, M, Wall, M, Wang, S, Crystal, S, Bridge, JA, Liu, SM, & Blanco, C 2018, 'Suicide after deliberate self-harm in adolescents and young adults', Pediatrics, vol. 141, no. 4, e20173517. doi: 10.1542/peds.2017-3517

Öneren, M, Arar, T & Įelebioglu, ES 2016, 'Determining the overall stress factors for policemen by AHP Method', International Journal of the Analytic Hierarchy Process, vol. 8, no. 3. doi: 10.13033/ijahp.v8i3.384

Owusu-Ansah, FE, Addae, AA, Peasah, BO, Asante, KO & Osafo, J 2020, 'Suicide among university students: prevalence, risks and protective factors', Health Psychology and Behavioral Medicine, vol. 8, no. 1, pp. 220-233. doi: 10.1080/21642850.2020.1766978

Park, CHK et al. 2020, 'Suicide risk factors across suicidal ideators, single suicide attempters, and multiple suicide attempters', Journal of Psychiatric Research, pp. 1-8. doi: 10.1016/j.jpsychires.2020.08.018

Pillay, J 2021, 'Suicidal behaviour among university students: a systematic review', South African Journal of Psychology, vol. 51, no. 1, pp. 54–66. doi: 10.1177/0081246321992177

Primananda, M & Keliat, BA 2019, 'Risk and protective factors of suicidal ideation in adolescents', Comprehensive Child and Adolescent Nursing, vol. 42(sup1), pp. 179–188. doi: 10.1080/24694193.2019.1578439

Private university reels from two student suicides in space of a week. (2019, May 15). *New Straits Times*. https://www.nst.com.my/news/nation/2019/05/488510/private-university-reels-two-student-suicides-space-week

Rajabi, F, Molaeifar, H, Jahangiri, M, Taheri, S, Banaee, S & Farhadi, P 2020, 'Occupational stressors among firefighters: application of multi-criteria decision making (MCDM) Techniques', Heliyon, vol. 6, no. 4, p. e03820. doi: 10.1016/j.heliyon.2020.e03820

Sodhro, AH, Shaikh, FK, Pirbhulal, S, Lodro, MM & Shah, M A 2017, 'Medical-QoS based telemedicine service selection using analytic hierarchy process', Handbook of large-scale distributed computing in smart healthcare, pp. 589-609. Springer, Cham. doi: 10.1007/978-3-319-58280-1_21

Turecki, G & Brent, DA 2016, 'Suicide and suicidal behaviour', Lancet (London, England), vol. 387(10024), pp. 1227–1239. doi: 10.1016/S0140-6736(15)00234-2

Unver, S & Ergenc, I 2020, 'Safety risk identification and prioritize of forest logging activities using analytic hierarchy process (AHP)', Alexandria Engineering Journal, vol. 60, no. 1, pp. 1591-1599. doi: 10.1016/j.aej.2020.11.012.

Wasserman, D, Carli, V, Iosue, M, Javed, A & Herrman, H 2021, 'Suicide prevention in childhood and adolescence: A narrative review of current knowledge on risk and protective factors and effectiveness of interventions', Asia-Pacific Psychiatry, vol. 13, no. 3. doi: 10.1111/appy.12452

World Health Organization (WHO) 2021, *Suicide*. Retrieved from https://www.who.int/news-room/fact-sheets/detail/suicide

Yu, R, Chen, Y, Li, L, Chen, J, Guo, Y, Bian, Z, Lv, J, Yu, C, Xie, X, Huang, D, Chen, Z & Fazel, S 2021, 'Factors associated with suicide risk among Chinese adults: A prospective cohort study of 0.5 million individuals', PLoS Medicine, vol. 18, no. 3, p. e1003545. doi: 10.1371/journal.pme d.10035 45