DR. SIMON JACKSON
FACULTY OF HEALTH, ARTS AND DESIGN,
SWINBURNE UNIVERSITY OF TECHNOLOGY MELBOURNE, AUST

DR. AZYYATI ANUAR
FACULTY OF BUSINESS MANAGEMENT,
UNIVERSITI TEKNOLOGI MARA (UiTM)KEDAH BRANCH, MALAYSIA

DR. FARYNA MOHD KHALIS
COLLEGE OF CREATIVE ARTS,
UNIVERSITI TEKNOLOGI MARA (UiTM)KEDAH BRANCH, MALAYSIA

DR IDA NORMAYA MOHD NASIR
FACULTY COMPUTER SCIENCE AND MATHEMATICS,
UNIVERSITI TEKNOLOGI MARA (UiTM)KEDAH BRANCH, MALAYSIA

DR MOHD FAIZAL JAMALUDIN
FACULTY OF ACCOUNTANCY,
UNIVERSITI TEKNOLOGI MARA (UiTM)KEDAH BRANCH, MALAYSIA

DR. MUHAMAD KHAIRUL ANUAR ZULKEPLI
ACADEMY OF LANGUAGE STUDIES,
UNIVERSITI TEKNOLOGI MARA (UiTM)KEDAH BRANCH, MALAYSIA

DR NOR ARDIYANTI AHMAD
FACULTY OF ADMINISTRATIVE SCIENCES & POLICY STUDIES,
UNIVERSITI TEKNOLOGI MARA (UiTM)KEDAH BRANCH, MALAYSIA

DR NURLELI, S.E.
FACULTY OF ACCOUNTING, UNISBA, INDONESIA

CONTENT REVIEWER

PROF MADYA DR NOOR ZAHIRAH MOHD SIDEK,
UNIVERSITI TEKNOLOGI MARA (UiTM)KEDAH BRANCH, MALAYSIA

PROF MADYA DR NUR HISHAM IBRAHIM,
UNIVERSITI TEKNOLOGI MARA (UiTM)PERAK BRANCH, MALAYSIA

PROF MADYA TS DR AZHARI BIN MD HASHIM,
UNIVERSITI TEKNOLOGI MARA (UiTM)KEDAH BRANCH, MALAYSIA

DR IDA NORMAYA MOHD NASIR,
UNIVERSITI TEKNOLOGI MARA (UiTM)KEDAH BRANCH, MALAYSIA

DR LAW KUAN KHENG,
UNIVERSITI TEKNOLOGI MARA (UiTM)KEDAH BRANCH, MALAYSIA

DR. MUHAMAD KHAIRUL ANUAR ZULKEPLI
ACADEMY OF LANGUAGE STUDIES,
UNIVERSITI TEKNOLOGI MARA (UiTM)KEDAH BRANCH, MALAYSIA

DR. NEESA AMEERA MOHAMMED SALIM
COLLEGE OF CREATIVE ARTS,
UNIVERSITI TEKNOLOGI MARA SHAH ALAM, MALAYSIA

DR NOR ARDYANTI BINTI AHMAD,
UNIVERSITI TEKNOLOGI MARA (UiTM)KEDAH BRANCH, MALAYSIA

DR NOR ASHIKIN AB MANAN
UNIVERSITI TEKNOLOGI MARA (UiTM) PERAK BRANCH, MALAYSIA

DR NUR AIDA BINTI KIPLI,
UNIVERSITI TEKNOLOGI MARA (UiTM)SARAWAK BRANCH, MALAYSIA

DR NUR SYAZWANIE BINTI MANSOR,
UNIVERSITI TEKNOLOGI MARA (UiTM)KEDAH BRANCH, MALAYSIA

DR NURAMIRA ANUAR
UNIVERSITI TEKNOLOGI MARA (UiTM)PERAK BRANCH, MALAYSIA

DR PUTERI ROHANI MEGAT ABDUL RAHIM
UNIVERSITI TEKNOLOGI MARA (UiTM)PERAK BRANCH, MALAYSIA

DR ZURAIDA MOHAMMED ISA,
UNIVERSITI TEKNOLOGI MARA (UiTM)KEDAH BRANCH, MALAYSIA

F. PETER A/L G. FRNCIS
UNIVERSITI TEKNOLOGI MARA (UiTM)PERAK BRANCH, MALAYSIA

MOHD SYAFIQ YA SHAK
UNIVERSITI TEKNOLOGI MARA (UiTM)PERAK BRANCH, MALAYSIA

LANGUAGE REVIEWER

PROF DR ONG ENG TEK
EDUCATION DEPARTMENT, USCI, KUALA LUMPUR
ANNUR INITATIVE RESOURCES SDN BHD

AISHAH BT MUSA,
ACADEMY OF LANGUAGE STUDIES,
UNIVERSITI TEKNOLOGI MARA (UiTM)KEDAH BRANCH, MALAYSIA

DR ZARLINA MOHD ZAMARI
ACADEMY OF LANGUAGE STUDIES,
UNIVERSITI TEKNOLOGI MARA (UiTM)PERAK BRANCH, MALAYSIA

DR NUR SYAZWANIE BINTI MANSOR,
ACADEMY OF LANGUAGE STUDIES,
UNIVERSITI TEKNOLOGI MARA (UiTM)KEDAH BRANCH, MALAYSIA

JUWAIRIAH OSMAN,
UNIVERSITI MALAYA , MALAYSIA

MOHD ZAKI RAMLI,
PROOFREADER UNITED, MALAYSIA

MUHAMMAD AIMAN ABDUL HALIM,
ACADEMY OF LANGUAGE STUDIES,
UNIVERSITI TEKNOLOGI MARA (UiTM)PENANG BRANCH, MALAYSIA

NORLIZAWATI MD TAHIR,
ACADEMY OF LANGUAGE STUDIES,
UNIVERSITI TEKNOLOGI MARA (UiTM)KEDAH BRANCH, MALAYSIA

SAMSIAH BINTI BIDIN,
ACADEMY OF LANGUAGE STUDIES,
UNIVERSITI TEKNOLOGI MARA (UiTM)KEDAH BRANCH, MALAYSIA

YANG SALEHA ABD GHANI,
ACADEMY OF LANGUAGE STUDIES,
UNIVERSITI TEKNOLOGI MARA (UiTM)PERLIS BRANCH, MALAYSIA

9 772682 784004

TABLE of CONTENTS

DETERMINATION OF FACTORS CONTRIBUTING TO DRUG ABUSE USING FUZZY ANALYTICAL HIERARCHY PROCESS (FAHP)

Norpah Mahat[1]*, Nur Khairunnisa[2], Jasmani Bidin[3], Sharifah Fhahriyah[4] Mohamad Najib Mohamad Fadzil[5], Izleen Ibrahim[6]

[1,2,3,4,5,6] *College of Computing, Informatics and Mathematics, Universiti Teknologi MARA(UiTM), Perlis Branch, Arau Campus, Perlis, MALAYSIA*

ARTICLE INFO

ABSTRACT

Abuse of drugs or any dangerous substance is a very worrying global cross-border issue that can destroy the lives of individuals and communities. Drug abuse is also a critical problem in Malaysia, especially in Perlis. Drug abuse among youth is a very real and prevalent issue which involves all races and genders with different financial backgrounds. The Director General of National Anti-Drug Agency (AADK) stated that in 2023, the number of drug addicts in Malaysia has increased by 27% for the first 6 months to 118,820 compared to 93,534 addicts reported in the same period last year. 65% of the total number involved were youth and teenagers. This fact is very worrying because if actions were not taken to curb this problem, eventually, it would continue to worsen and become a critical problem for our country. The aim of this study is to rank the factors of drug abuse particularly in Perlis and to identify the main factors of drug abuse. Fuzzy Analytical Hierarchy Process (FAHP) is used in analysing the data. This method facilitates to rank the factors based on the data collected from five (5) professional AADK staffs. The result of this study found the main factors of drug abuse that are taking drugs for pleasure followed by managing depression or stress, taking drugs as a stimulant, for pain endurance, curiosity, accidental consumption, peer influence and other factors.

1.   Introduction

According to the National Cancer Institute Dictionary of Cancer, the terms "drug abuse" is defined as the use of illegal drugs or the use of prescription or over-the-counter drug use for which they are meant to be used, or in large amounts. Addiction is something that is out of one's control, and it is very dangerous. The lives of addicts will gradually and irrevocably go out of control and sometimes they lie or steal and behave aggressively (Nora, 2020).

Drug abuse is a situation when it is medically and socially disapproved (Bosli et. al, 2017). The increasing abuse of methamphetamine and the emergence of new types of psychoactive drugs are the major threat to current drug addiction problems, which increased by 136% from 2009 to 2017. According to National Anti-Drug Agency (AADK, 2022) the total number of drug addicts in Malaysia was 137,176 and the data increased by 11.4% compared to the 2021. Perlis ranked third in drug abuse which were 760 people for every 100,000 population.

Recently in *The Malay Mail (*2023), AADK reported that drug abuse in Malaysia has increased by 27% for the first 6 months of 2023 to 118,820 addicts compared with 93,534 addicts reported in the same period last year. 65% of the total numbers of drug addicts involved were youth and teenagers. Perlis, Kedah, Kelantan, and Terengganu were among the states that recorded the highest ratio per 100,000 residents involved in the problem of drug abuse. Meanwhile, Selangor recorded the highest number of addicts. Specifically, Perlis states administration must take immediate actions to reduce the number of drug addiction cases. This fact is very worrying because if action is not taken to curb this problem, it will continue to worsen and has devastating impact on the people of Malaysia especially the younger generation.

The younger generation is an asset to the nation who will continue its legacy. They will be the leaders in the future. The advancement of a country lies in the hands of today's generation as they are the heirs of the nation's leadership. Latib (2018) mentioned drugs were the main enemy that can destroy the lives of the young generation who are the future leaders. Muzaffar (2020) highlighted in Malaysia, the effects of drug abuse can lead to harmful situation. Drugs can cause family break-ups, social problems, disruption of community's harmony and endanger the local people.

Therefore, the factors that contribute to drug abuse will be investigated to help the authorities prevent the new generation involved with drugs. If the younger generation is free from drugs, then, the future of Malaysia will be guaranteed with the nation leaders who are good in physical and mental health. Through this study, it will help government agencies to reduce drug abuse statistics by focusing more on these key factors.

Since there is no study about drug abuse in Perlis, this study focuses on finding the factors of drug abuse in Perlis. Therefore, the main objective of this study is to analyse the main factors of drug abuse in Perlis by using Fuzzy Analytical Hierarchy Process (FAHP). The sub-objectives are to rank the factors of drug abuse and identify the main factors of drug abuse in Perlis.

2.   Literature Review

This section discusses the factors that contributed to drug abuse found by previous studies and the method used which was the Fuzzy Analytical Hierarchy Process (FAHP). The

factors that caused the drug abuse have been identified including peer influence, curiosity, taking drug for fun, depression, pain endurance, accidental consumption, taking drugs for stimulant and others (including employment, level of education, money problems and more).

2.1   Peer Influence

A study by Shahera and Azizan (2021) showed that the drug addicts among youth in Selangor agreed that one of the factors of drug abuse was caused by peer influence apart from family environment and neighbourhood influence. Mohamad and Kamarudin (2015) stated that the factors of drug abuse were depression, lack of awareness and peer influence. The results of the study conducted on 200 adolescents also found that most adolescents were influenced by friends to take drugs for emotional support (Ibrahim & Zakaria, 2014).

Furthermore, Badariah et. al. (2015), Baba et. al. (2018) and Mohd Ekhwan et. al. (2018) stated that environmental factors that led to drug abuse was peer pressure. Almost 80% of the total of youths arrested by police confessed that peer pressure was the reason they involved with drugs (Latib, 2018). A problematic peer would be considered as a powerful individual since he or she serves as a network for drug trafficking (Jasni et. al, 2018). The statistics from 2014 until 2018 showed that peer pressure was the highest reason why youth took drugs (59%) (Md Salleh, 2020).

2.2   Curiosity

Curiosity encourages individuals to devote more attention to an activity, process information more deeply, remember information better and fulfil tasks more accurately (Raharja et. Al., 2018). Curiosity can be included into personal factors category. Based on the study by Bosli et al. (2017), personal factors include overcoming mental disorder, reducing pain, and curiosity. Yusoff (2019) showed that curiosity was one of the factors that contributed to drug abuse as the total of 3,208 new addicts (15.27%) and 1,0315 (20.33%) of repeated addicts who have tried drugs out of curiosity. Md Salleh (2020) stated other factors which caused the drug abuse were curiosity, recreational drug use and stress. Mohd Ekhwan et. al. (2018) in their study in Terengganu also found curiosity was the factor which has influenced the drug abuse.

2.3   Taking Drugs for Fun

Taking drugs for fun or for pleasure was one of the factors of drug abuse. Junior and older people took drugs for fun, enjoyment, and socialisation. According to Jennifer (2019), people use party drugs because it gives them energy to dance and socialise, reduce inhibition, and enhance the feeling of connection to others. Health Direct (2019) explained the Party drugs are highly addictive and if people use them regularly, it can be hardly stopped. Mohd Ekhwan et. al. (2018) also indicated that youth took drugs for fun.

2.4   Depression or Stress

Huntley (2015) found that adolescents have a high possibility of experiencing depression when they have behavioural problems, genetic problems, problems with their parents, academic problems, or drug addiction. High expectations from family and society have led the possibility for adolescents to experience depression and due to this reason, they took drugs as a solution. According to Degenhardt et al. (2003), there were a significant relationship between depression and drug abuse among adolescents and this finding was also supported by Huntley Njoko and Obogo (2017). Espada et al. (2011) found that depression is associated with tobacco and alcohol use rather than cannabis and adolescents took these drugs to forget their problems.

2.5   Pain Endurance

Over the years, medication has been shown to reduce chronic pain, manage posttraumatic stress disorder (PTSD), increate the syndrome, alleviate vomiting, decrease intraocular pressure associated with glaucoma and reduce symptoms of Crohn's disease (Lallanilla, 2013). The drugs used in the medical world are controlled and they help the patients to manage their pain. Mohd Ekhwan et. al. (2018) mentioned the enduring pain or body defence has caused adolescents to take drugs. Cough syrup is also one of the drugs that influences adolescents (Njoku & Obogo, 2017). It is easy to buy because it is available over the counter at an affordable price. For instance, methadone is used as substitute therapy for drug addiction as it can reduce drug addiction like heroin which has positive effects. However, addicts continue to depend on the drug. According to Azimi and Abu Bakar (2019), the effects of taking methadone will result the addicts to depend on the drug for the rest of their lives.

2.6   Accidental Consumption

Anyone can involve in drug abuse either intentionally or accidental consumption. Athletes have a higher chance of getting involved with drugs because some athletes use drugs to increase their sporting capabilities. According to MyHEALTH (2012), an official portal of the Ministry of Health Malaysia, doping is the use of banned substances or methods to improve sports performance. Athletes accidentally dope when they take a medicine to treat illness or injuries without knowing that it contains a prohibited substance. Yusoff (2019) has written in his article that 0.03% of drug addicts accidentally took drugs. Md Salleh (2020) also stated that one of the factors of drug abuse was accidental consumption. These show that accidental consumption can be included as one of the factors of drug abuse.

2.7   Taking Drugs for Stimulation

According to MyHEALTH (2012), stimulants are mixture of psychoactive substances that have negative effects on the central nervous system, which consists of the brain and spinal cord. Majid (2019) stated that stimulants were a group of drugs that act on the brain to produce stimulatory effect such as increasing focus on activities and relieving tiredness. The American Addiction Centers (2019) also noted that people who take stimulants experience heightened energy levels and enhanced focus. It also increases the speed of mental and physical processes that can create desirable effects in the short-term by increasing the levels of dopamine in the brain.

Taking drugs for the stimulating effect is a minor factor that contributes to drug abuse at 0.05% based on data in 2015 (NADA, 2019). Drugs have also been used by adolescents to work for longer hours and avoid fatigue. Based on BH Online (2019), a user claimed the long work shifts and not taking enough rest to 48 hours led the person to seek Shabu-type drugs to get more strength and alleviate exhaustion to work overtime.

2.8   Fuzzy Analytical Hierarchy Process (FAHP)

FAHP is one of the mathematical models that uses analytical mathematics to handle an individual's inescapable subjective and personal interest in making decisions. FAHP is a relative measurement theory and methodology for relative measurement (Brunelli, 2015). It is one of the

most widely approaches in multiple criteria of decision making (MCDM), mixing subjective and personal interest in the risk assessment process (Radionovs & Užga-Rebrovs, 2016). Putra et al. (2018) defined FAHP as a decision support method used to complete the problem by solving the solution, grouping, and rearranging it into a hierarchical structure.

This method could assist decision making problems in real life. For example, Chou and Yu (2013) proposed a hybrid FAHP model to solve a decision-making problem in an uncertain and multiple-criteria environment choice of international centres in the global logistics of multinational corporations. By using this method, it helps the decision maker to make more efficient, flexible, and realistic decisions based on the available criteria and alternatives (Kaur, 2014).

Based on the previous studies, FAHP method has been proven to be applicable and effective for solving many problems in the real life (Putra et al. 2018; Hapsari, & Subiyanto, 2020). All previous studies relied on the objective of decision-making method to rank the factors of drug abuse and the finding of the main factors indicate FAHP is highly appropriate to be used in this study.

3.   Methodology

This study requires data on the prevalence of drug abuse in Perlis. The data was collected from the experts who were five (5) professional staffs at the Malaysian National Anti-Drug Agency, Perlis. The experts were from Treatment, Medicational and Rehabilitation division, Enforcement and Security division and Policy, Planning and Study division. The primary data was collected from the experts using Fuzzy Analytic Hierarchy Process (FAHP) method which required experts' comments. It was prepared by using a questionnaire. The contents of the data were divided into eight (8) variables: peer influence, curiosity, taking drugs for fun, stress, pain endurance, accidental consumption, taking drugs for stimulant and others (including employment, level of education, money problems).

The data collected were analysed using the Fuzzy Analytical Hierarchy Process (FAHP) method and assisted by Microsoft Excel software. Briefly, there were three (3) main phases for FAHP. These phases supported the decision-making which was the selection of the best alternative among the others, hierarchical structuring, pair-wise comparisons that determine weights. Hierarchical structure of FAHP consisted of three levels which were Upper-level, Mid-level, and Sub-level. The Upper-level phase found the goal which the studier intended to achieve in the study. The Mid-level phase prepared the criteria that would be used to determine the main factors of drug abuse. These two steps were used in this analysis, but the third phase was an alternative or sub-criteria which did not involve in this study.

There were six (6) steps involved in solving the decision-making problem with FAHP. The steps are described as follows.

Step 1: Decision making problem.

The first step was needed to define the problem and determine the desired solution. The number of decision points was symbolised by m and the number of factors influencing those points was symbolised by n. In particular, the right estimation of the number of factors affecting the outcome was necessary for a reliable and rational pairwise comparison.

Step 2: The comparison matrix between factors is formed.

The matrix of comparison was the *n×n* dimensional square matrix of all the components in the dimensions of the hierarchy system. The linguistic term was to be assigned to pairwise comparisons by asking which of the two dimensions was the most relevant. The matrix components on the diagonal of this matrix were set to one value. The matrix of comparison is shown in the following formula.

$$S_{ij} = \begin{bmatrix} (a_{11},b_{11},c_{11}) & (a_{12},b_{12},c_{12}) & \cdots & (a_{1n},b_{1n},c_{1n}) \\ (a_{21},b_{21},c_{21}) & (a_{22},b_{22},c_{22}) & \cdots & (a_{2n},b_{2n},c_{2n}) \\ \vdots & \vdots & \vdots & \vdots \\ (a_{n1},b_{n1},c_{n2}) & (a_{n2},b_{n2},c_{nm}) & \cdots & (a_{nm},b_{nm},c_{nm}) \end{bmatrix} \tag{1}$$

$$S_{ij} = \begin{bmatrix} 1 & (a_{12},b_{12},c_{12}) & \cdots & (a_{1n},b_{1n},c_{1n}) \\ 1/(a_{21},b_{21},c_{21}) & 1 & \cdots & (a_{2n},b_{2n},c_{2n}) \\ \vdots & \vdots & \vdots & \vdots \\ 1/(a_{n1},b_{n1},c_{n2}) & 1/(a_{n2},b_{n2},c_{n2}) & \cdots & 1 \end{bmatrix}$$

In this phase, the linguistic variable was determined. The linguistic parameter was described in terms of collection: it is an array of linguistic terms. Linguistic terms were arbitrary definitions for the linguistic element. *S* linguistic variable was a variable which value were words or phrases in a natural or iatrical word. The computational technique was assessed based on the following fuzzy number described by Gumus (2009).

Table 1
Membership function of linguistic scale

Fuzzy number	Linguistic	Scale of fuzzy number
9	Perfect	(8,9,10)
8	Absolute	(7,8,9)
7	Very good	(6,7,8)
6	Fairly good	(5,6,7)
5	Good	(4,5,6)
4	Preferable	(3,4,5)
3	Not bad	(2,3,4)
2	Week advantage	(1,2,3)
1	Equal	(1,1,1)

Source: Gumus (2009)

Table 1 displays an example of membership function of linguistic scale. The scale of the fuzzy number is defined by three (3) parameters of the symmetrical triangular fuzzy number, which is left, middle and right.

Step 3: Calculation of the Average Fuzzy Number Preference

In this step, the average fuzzy number preference was calculated by dividing the sum of value with the number of respondents. If the situation involved more than one respondent, *m* would be

the number of respondents. The equation (2) and (3) show the calculations of pairwise comparison matrix G.

$$(a_{ij}, b_{ij}, c_{ij}) = \frac{\sum_{k=1}^{m}(a_m^k, b_m^k, c_m^k)}{m} \ for \ i, j, m = 1, 2, 3 \tag{2}$$

$$G = \begin{bmatrix} (a_{11}^k, b_{11}^k, c_{11}^k) & \cdots & (a_{1n}^k, b_{1n}^k, c_{1n}^k) \\ \vdots & \ddots & \vdots \\ (a_{n1}^k, b_{n1}^k, c_{n1}^k) & \cdots & (a_{nm}^k, b_{nm}^k, c_{nm}^k) \end{bmatrix} \tag{3}$$

Step 4: Calculation of the Geometric Mean of Fuzzy Comparison Value

The fuzzy geometric mean and fuzzy weights of each criterion as described in Equation (4) and (5) is calculated in this step.

$$r_i = ((a_{i1}, b_{i1}, c_{i1}) \otimes \ldots \otimes (a_{ij}, b_{ij}, c_{ij}) \otimes \ldots \otimes (a_{in}, b_{in}, c_{in}))^{1/n} \tag{4}$$

$$w_i = r_i \otimes (r_1 \otimes \ldots \otimes r_i \otimes \ldots \otimes r_n)^{-1} \tag{5}$$

The variable r_i refers to geometric mean of fuzzy comparison value of criterion i for each criterion. w_i is referred to the fuzzy weight of the *i-th* criterion which can be shown by lower, middle and upper values of the fuzzy weight. Then, the vector summation for each r_i is calculated with the (-1) power of summation vector as described in Equation (6). The final value will be replaced in the form of increasing order.

$$r^{-1} = \left(\frac{1}{\sum c_n}, \frac{1}{\sum b_n}, \frac{1}{\sum a_n} \right) \tag{6}$$

Step 5: De-fuzzify the Fuzzy Weight of Criterion

In this step, the value of fuzzy weight needs to be de-fuzzified to obtain the ranking order of the decision element. P_i is referred to the de-fuzzify value calculated as shown in Equation (7).

$$P_i = \frac{a_{wi} + b_{wi} + c_{wi}}{n} \tag{7}$$

Step 6: Normalise the De-fuzzified Weight of Criterion

Once P_i is calculated, the value of non-fuzzy number, Q_i will be determined. Equation (8) shows the formula of the normalization. Normalization is importance to change the value of numeric column in the dataset to a common scale without distorting differences in the range of values.

$$Q_i = \frac{P_i}{\sum_{i=1}^{n} P_i} \tag{8}$$

By performing the last step, the value of normalised weight will be determined and the criteria from the highest to the lowest value can be ranked.

4.   Results

There were eight (8) criteria used to be ranked in this study which were peer influence, curiosity, taking drug for fun, stress or depression, pain endurance, accidental consumption, taking drugs for stimulation and others. All the criteria were ranked based on the weight value.

FAHP was used to find the geometric mean of fuzzy comparison valued for all criteria. Equation (4) was used to find the value of geometric mean. All calculations for the geometric mean of fuzzy comparison were manually calculated. Table 2 shows the geometric mean of fuzzy comparison values where each column represents the fuzzy triangular number denoted as (l,m,u). The total value for each of the criterion, the reverse value and the values in increasing order are shown in the Table 2. The value of increasing order is important to find the value of fuzzy weight. The values are 0.049, 0.056 and 0.065.

Table 2
The geometric mean of fuzzy comparison values.

Criteria	Geometric Mean		
	l	m	u
1	1.429	1.594	1.772
2	1.657	1.947	2.3004
3	3.148	3.678	4.197
4	2.917	3.337	3.751
5	1.867	2.217	2.56
6	1.432	1.777	2.106
7	2.015	2.279	2.539
8	0.994	1.125	1.283
Total	15.459	17.95	20.509
Reverse(-1)	0.065	0.056	0.049
Increasing Order	0.049	0.056	0.065

Next, the calculation of fuzzy weight of the criterion was applied and the results are shown in Table 3. After that, non-fuzzy weight was calculated by using Centre of Area method which can be referred in Equation (5). The value of P_i needed to be normalised by dividing with the total value of non-fuzzy weight that is shown in Equation (7) and the values of normalised relative weight for each criterion are tabulated on Table 4.

Table 3 Fuzzy weight of the criterion

Criteria	Fuzzy Weight		
	l	m	u

1	0.07	0.089	0.115
2	0.081	0.109	0.15
3	0.154	0.206	0.273
4	0.143	0.187	0.244
5	0.091	0.124	0.166
6	0.07	0.0995	0.137
7	0.099	0.128	0.165
8	0.049	0.063	0.083

Table 4 shows the value of de-fuzzified, P_i and normalized relative weight, Q_i for eight criteria which are peer influence, curiosity, taking drug for fun, stress or depression, pain endurance, accidental consumption, taking drugs for stimulation and others. For peer influence, the value obtains 0.0885 while curiosity obtains 0.1098. The values of normalized relative weight for taking drug for fun, stress or depression, pain endurance, accidental consumption and taking drug for stimulation are 0.2045, 0.1854, 0.1231, 0.0991 and 0.1267. Lastly, for factor others, the value obtains 0.063.

Table 4
Non-fuzzy and normalized relative weight of criteria

Criteria	P_i	Q_i
1	0.0913	0.0885
2	0.1133	0.1098
3	0.211	0.2045
4	0.1913	0.1854
5	0.127	0.1231
6	0.1022	0.0991
7	0.1307	0.1267
8	0.065	0.063

Table 5 presents the normalised non-fuzzy relative weights for each criterion. Based on Table 5, it shows the criteria that contribute to drug abuse in Perlis. It is ranked based on the value of weight from the highest value to the lowest value. The results show that taking drugs for fun is the main factor that contributes to drug abuse with the highest weight value which is 0.2045. While stress or depression is at second place with the weight value at 0.1854. Then, taking drugs for stimulants and taking drugs to endure pain are ranked at third and fourth place with weight values at 0.1267 and 0.1231. The difference between taking drugs for fun and enduring pain is 0.0036. After that, the values of weight for curiosity and accidental consumption are 0.1098 and 0.0991 respectively which place these two factors at the fifth and sixth rank. Lastly, the least impactful factors of drug abuse are peer influence and others which are at the seventh and eighth rank with the values of weight are 0.0885 and 0.063 respectively.

Table 5
Ranking of criteria based on normalized non-fuzzy relative weight

Criteria	Weight	Ranking
Peer Influence	0.0885	7
Curiosity	0.1098	5
Taking Drug for Fun	0.2045	1
Depression	0.1854	2
Pain Endurance	0.1231	4
Accidental Consumption	0.0991	6
Taking Drug for Stimulants	0.1267	3
Others	0.063	8

5.   Discussion

The results display on Table 5 show the factors that have contributed to drug abuse in Perlis. The results indicate that taking drugs for fun is the main factor influences adolescents to take drugs with the highest weight value which is 0.2045. It is followed by stress or depression, taking drugs for stimulants, taking drugs to endure pain, curiosity, accidental consumption, peer influence and other factors. Based on these results, it determines the main factor which causes drugs abuse in Perlis is taking drugs for fun and pleasure.

The result of the study is in line with the director general of AADK statement in his recent speech reported in the *Malay Mail* (2023), which stated 67% of drug addicts were young people and teenagers. Moreover, he also stated that having too much free time without doing any activities was one of the main contributing factors for the teenagers and youngsters to involve in drugs. Obviously, taking drugs for fun is something that young people often do without thinking the consequence of their actions.

The result of this study is a little difference from other states in Malaysia. For example, Badariah et al. (2015) revealed that peer influence was a significant factor leading to drug abuse among youth in Kuala Lumpur. A study by Shahera and Azizan (2021) in Selangor found that the main factor influencing youth to commit drug abuse was neighbourhood influence which was proven by p-value<0.05. It was followed by family environment and peer influence factors. Another study done by Mohd Ekhwan et al. (2018) in Terengganu who identified that the most influential factor was due to peer influence, followed by curiosity, taking drug for fun and enduring pain.

Study in Kedah that was conducted by Badariah et al. (2019) found that there were four factors of drug abuse among youth including law awareness, lifestyle, and peer influence. Shafi and Chandrashekar (2021) did a pilot study in Perak Tengah district and their findings revealed that there was a strong positive correlation between perception of drug abuse with family relationship and peer influence.

Muhammad et al. (2020) has conducted an interview with the drug addicts that have been frequently admitted to the Narcotics Recovery and Addition Centre (PUSPEN) Jeli and Bachok, Kelantan. Their study identified the factors contributed to the relapse phenomenon which involved internal factors such as frustration, lack of willpower, anger, resentment, boredom and lack of religious knowledge and practice. Moreover, the external factors were income factor (scarce income and surplus income), lack of family support, rejection from the community, influence from the mass media, influence from old friends, and no place to go after being released from the rehab centre.

6.   Conclusion

This study which was conducted to rank and identify the main factors of drug abuse in Perlis by using the Fuzzy Analytical Hierarchy Process (FAHP) has achieved its objective with the help of five (5) ADDK professional staffs. There were eight (8) variables involved in this study which were peer influence, curiosity, taking drug for fun, depression, or stress, pain endurance, accidental consumption, taking drug for stimulant and others.

From the results of this study, it was found that the main factor of drug abuse was drug addicts who took drugs for fun since its value of weight is significantly higher than the other criteria. The reason why youths took drugs because they wanted to have fun and gain new experience. In addition, they were proud to announce to their friends about the new experience. They forgot all their problems when they were under the influenced of drugs. In fact, drugs were often used in places of entertainment such as nightclubs and parties. Other contributing factors in this study were depression or stress, taking drug for stimulation, pain endurance, curiosity, accidental consumption, peer influence and others.

In conclusion, this study was conducted to discover the contributing factors of drug abuse and to help the relevant authorities to identify the causes that lead to this issue in Malaysia. By identifying the main factors of drug abuse, it would enable the authorities to seek for the solution. For future studies, it is recommended to pay attention to drug addicts who relapse after leaving the rehabilitation centre.

Authors Contributions

Author 1 and 2 contributed to introduction, literature review, methodology, data analysis and finding. Author 3 and 4 refined the introduction, literature review and result. Author 5 and 6 refined the methodology, discussion, and conclusion.

Conflict of Interest

No conflict of interest associated with this publication.

References

Agensi Antidadah Kebangsan. (2022). Buku Maklumat Dadah 2022. *https://www.adk.gov.my/buku-maklumat-dadah-2022/*

American Addiction Centers. (2019). Stimulant Drug Types, Effects & Addiction Signs. *https://americanaddictioncenters.org/stimulant-drugs*

Azimi, M. A., & Abu Bakar, A. Y. (2019). The use of Methadon Medicine as a Drug Medicinal Therapy in The Treatment of Drug Addict: a Pre-Emergency Examination to Three Trainers of Drug Recovery Centers. *Global Conferences Series: Social Sciences, Education and Humanities (GCSSSEH)*, *1*, 168–176.

Baba, H., Sulaiman, W. S. W., Ibrahim, F. & Sarnon, N. (2018). Faktor-Faktor Penyumbang Kecenderungan Situasi Berisiko Tinggi Dalam Kalangan Penagih Dadah Berulang di Malaysia. *Jurnal Psikologi Malaysia*, *32*(2), 26–40.

Badariah, M.S., Siti, A.J., Zarina, D. & Nur Fatanah, T. (2015). Drug and Substance Abuse among Youth: A rehabilitation Centre in Kuala Lumpur. *2nd ABRA International Conference on Quality of Life,* 1(2), 3-11.

Badariah, M.S., Soo, C.C., Azhar, H.B. & Noor Rita, M.K. (2019). Factors on Drug Addition: A Case Study at the Cure&Care Rehabilitation Centre (CRCC). *Insight Journal*, 5, 274 – 284.

Bosli, F., Mokhtar, S. F., Shamsuddin, N. R., Zawawi, T. K. F. T. A., Mansor, K. A., & Salleh, W. (2017). Factors Affecting the Tendency of Drug Abuse among Drug Addicts: A Case Study in the Northern Region of Malaysia. *Jurnal Inovasi Pembelajaran (JINoP)*, 545–549.

Brunelli, M. (2015). Introduction to the Analytic Hierarchy Process. *Learning from Failures*. SpringerBriefs.

Chou, C. C., & Yu, K. W. (2013). Application of a new hybrid fuzzy AHP model to the location choice. *Mathematical Problems in Engineering*, 2013, 1-12.

Degenhardt, L., Hall, W., & Lynskey, M. (2003). Exploring the association between cannabis use and depression. *Addiction*, *98*(11), 1493–1504.

Espada, J. P., Sussman, S., Huedo Medina, T. B., & Alfonso, J. P. (2011). Relation between substance use and depression among Spanish adolescents. *International Journal of Psychology and Psychological Therapy*, *11*(1), 79–90.

Gumus, A. T. (2009). Evaluation of hazardous waste transportation firms by using a two step fuzzy-AHP and TOPSIS methodology. *Expert Systems with Applications*, 36(2), 4067–4074.

Hapsari, M. A., & Subiyanto, S. (2020). Fuzzy AHP Based Optimal Design Building-Attached Photovoltaic System for Academic Campus. *International Journal of Photoenergy,* 2020(1),1-17.

Health Direct. (2019). *Party Drugs* https://www.healthdirect.gov.au/party-drugs

Huntley, A. (2015). The Relationship Between Drug Use and Depressive Symptoms Among High School Students. *University of Connecticut*.

Ibrahim, F. & Zakaria, E. (2014). *Youth Involvement in Drug Abuse: Analysis on the Level of its Relationships with Peers*. Jurnal Pembangunan Sosial, 17, 71–85.

Jasni, M. A., Ah, S. H. A. B., Yusoff, J. Z. M., Shahid, K. M., & Azman, Z. (2018). Kekurangan Akses kepada Jagaan Lanjutan dan Faktor-Faktor Risiko Yang Membawa Kepada Relaps Dadah dalam Kalangan Bekas Banduan. *Jurnal Perspektif*, *10*(2), 34–44.

Jennifer P. (2019). In debates about drug use, fun is important. *The Conversation*. https://theconversation.com/in-debates-about-drug-use-fun-is-important-110696

Kaur, P. (2014). Selection of Vendor Based on Intuitionistic Fuzzy Analytical Hierarchy Process. *Advance in Operation Research*, 2014(1), 1-10.

Lallanilla, M. (2013). 6 Party Drugs That May Have Health Benefits. *Live Science*. https://www.livescience.com/41277-health-benefits-illegal-drugs.html

Latib, S. (2018). *Pengaruh rakan sebaya faktor utama terjebak dadah* . BHOnline.

Malay Mail (2023). National Anti-Drug Agency: Addiction cases up by 27pc in first six -anti-drug-agency-addiction-cases-up-by-27pc-in-first-six-months-of-2023/92064 months of 2023. *Malay Mail*. https://www.malaymail.com/news/malaysia/2023/09/21/national

Majid, M. I. A. (2019). Pusat Racun Negara - Kumpulan Dadah Peransang. *National Poison Centre, USM*.

Md Salleh, M. F. (2020). Masyarakat berperanan banteras salah guna dadah. *BHOnline*.

Mohamad, N. & Kamarudin, A. (2015). Kerinduan Atau Ketagihan Terhadap Dadah: Punca Belia Kecundang Dan Kembali Menagih. *International Drug Prevention and Rehabilitation Conference (Prevent 2015)*, Prevent, 200–215.

Mohd Ekhwan et. al. (2018). Evaluation of Drug Addicts Rate with Environmental Components Study in Terengganu, Malaysia. *International Journal of Engineering & Technology*, 7(2018), 26 - 29.

Muhammad et. al. (2020). Relapse among Drug Addicts in East Coast Malaysia: A Qualitative Study of Risk Factors. *International Journal of Academic Research in Business & Social Sciencesl,* 10(12), 432-447.

Muzaffar, S.M (2020). Drug Abuse Among Youth in Malaysia. *International Journal of Academic Research*, 9(1), 36-44.

MyHEALTH (2012). Drugs Abuse in Sports. Ministry of Health Malaysia Official Portal. http://www.myhealth.gov.my/en/drugs-abuse-in-sports/

National Anti-Drug Agency (NADA)(2020). Ministry of Home Affairs, Malaysia, https://www.adk.gov.my/en/public/drugs-statistics

Njoku, J. N., & Obogo, G. O. (2017). Prevalence of depression and its relationship with drug abuse among senior secondary school students in Calabar, Calabar Cross river state, Nigeria. *Global Journal of Educational Research, 16*(2), 155.

Nora, D.V. (2020). Stigma and the Toll of Addiction. *The New England Journal of Medicine,* 382, 1289-1290.

Putra, M. S. D., Andryana, S., Fauziah & Gunaryati, A. (2018). Fuzzy analytical hierarchy process method to determine the quality of gemstones. *Advances in Fuzzy Systems*, 2018, 1-6.

Radionovs, A., & Užga-Rebrovs, O. (2016). Fuzzy analytical hierarchy process for ecological risk assessment. *Information Technology and Management Science*, 19(1), 16–22.

Raharja, S., Wibhawa, M. R., & Lukas, S. (2018). Mengukur rasa ingin tahu siswa. *Jurnal Ilmiah*, *14*(2), 151.

Shafi, M.A. & Chandrashekar, R. (2021). The Relationship between Factors of Drug Abuse and Perception among Youth in Malaysia. *Research in Management of Technology and Business,* 2(2), 86-91.

Shahera, N.D. & Azizan, Z. (2021). Social Determinants of Drug Abuse Among Youth in Selangor: A Case Study in Serendah's Rehabilitation Centre. *Journal of Administrative Science*, 18(1), 219-236.

Yusoff, A. N. M. (2019). Perangi Dadah Habis-Habisan . *Fakulti Ekologi Manusia, UPM*.