Fuzzy Analytic Hierarchy Process to Solve the Child Abuse Problem

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ABSTRACT

Children always bring so much joy, happiness and laughter to one's life. Unfortunately, they were always being the target to abuse. The effects of child abuse are severe and long-lasting to the victims. While recently Malaysia statistic has reported a significant increment of child abuse cases that have reported in this country. The graph presents a steady growth of these cases without showing any sign of decrement. The victim is only a child, who is innocent, powerless, and incapable to protect themselves without any help, care and support from people around themselves. Hence, this study purposed to determine the main factors that contribute to child abuse cases in Malaysia. In this study, FAHP (Fuzzy Analytic Hierarchy Process) are used to determine the main factors that contribute to the child abuse cases in Malaysia. The data was collected from the official portal of the Department of Social Welfare, Ministry of Women, Family and Community Development. The factors used in this study are family dispute, followed boyfriend, unknown, financial problem, negligence of parents or guardian, illegitimate child, stepchild, adopted child or preserved by others during childhood, alcoholic, gambler, drug addicts, abuser suffered mental health problems, abuser was formerly abused and others. Three criteria consist of perpetrators, type of carer occupations and gender of the victim are taken into consideration. The result shows the family dispute was determined as the main factors of child abuse compared to the other factors. This finding is very important for the use of the Ministry of Women, Family and Community Development responsible for the formulation of policies and guidelines on the development of children, women and families in Malaysia. This effort is expected to reduce the rate of child abuse in turn giving them a better life.

INTRODUCTION

Child abuse is defined as all terms and forms of violence either physical, emotional, sexual, maltreatment or exploitation. In child maltreatment, the child is abused for no reason and left to face the impact of a rough relationship encounter(s) (Tanaka et al., 2011). Children who involved in abuse always feel worthless, damaged, nobody love and concern or imperiled. Hence, it should be taken seriously, provide ways to protect, help the victim and to prevent it from happening.

In this country, the data on child abuse cases that have reported a significant increment. In the year of 2001 till 2015, Royal Malaysian police collected data that shows a fixed growth of total reported child abuse crisis and unfortunately, not showing any sign of decrement (Taib & Filzah, 2015). Sadly, the incidents of child abuse reported are just the beginning of all cases, and the statistics are frequently misleading.

Even in this country, many laws for protecting children welfare have been developed. Children are an integral asset for the future development of a nation. Instead of this notion, countries pay much attention to their growth and well-being. The uncertain outcome of these issues is its necessary connotation on each of the family members and the nation's aspiration to reach a better tomorrow. Many initiatives conducted by various social and by the Ministry, such as Promotion of Child Rights and Child Protection are essential to address the critical issue of Child sexual abuse and exploitation.

Moreover, many cases remain to be buried from the public knowledge and unreported every year due to factors such as shame, social stigma, guilt, lack of awareness, fear of the future of the child, fear of going through the legal battles and many more. Unfortunately, these factors cause children to suffer in the long-term allowed to be unrevealed. Therefore, there is a need to determine the factors of child abuse to construct the effective strategies and prevention methods to overcome the vital issue of child abuse.

A Fuzzy Analytic Hierarchy Process (FAHP) becomes a popular method in ranking important information (Fatemeh et al., 2019; Mahmoodzadeh et al., 2007; Özdağoğlu, 2007; Kabir & Hasin, 2011; Çebi & Karal, 2017; Erkan & Can, 2014). FAHP is a problem-solving method which is the combination of AHP (Analytical Hierarchy Process) approach that use a fuzzy logic and linguistic variables (Erkan & Can, 2014). The AHP is one of the multi-criteria decision-making (MCDM) methods used for selecting the rightful and not entirely ideal and alternative. The AHP method categorizes the evaluation of experts' opinions on alternatives according to relevant criteria. FAHP is derived from traditional AHP to make decisions related to quantitative and qualitative criteria. FAHP is used in stage where AHP is not sufficiency in deterministic evaluation. Thus, this study will be used FAHP to determine the factors of child abuse.

BACKGROUND

This section will describe the background of the factors contribute to child abuse, criteria of the factors and fuzzy analytic hierarchy process.

i. Child Abuse Factors

Family Dispute
Noremy et al. (2012) in their study stated that family issues positively were the leading influences that force to child abuse. While the conflict occurred between family members or partners was also the main factor. Besides, Choo et al. (2011) on their recent study stated that the factors were weak in the study and lack of parent-child relationships. The conflict that occurs between any members of a family can be argument or jealousy, weak and lack communication which can result in misunderstandings and little decisiveness. Furthermore, various things could lead to family dispute such as split with partners, desertion, shortage and money difficulties, or even interference of relatives.

Followed Boyfriend
Abdullah and Shah Haneef (2017) defined in their study show that approximately 70 percent of known suspects were the boyfriends and acquaintances of the victims. While Cheah and Choo (2016) in their study found that most of the perpetrators of child sexual abuse are known to the child sexual abuse survivors.

Unknown
Abas (2012) in her study stated that the cause of child violence has remained unknown and until now no single factor results in abuse. Besides, the unknown factor of child abuse has been stated by Malaysian

Department Social Welfare in their annual statistic report under part of children in need of care and protection by cause of abuse.

Financial Problem

Meanwhile, based on the study that was conducted by Noremy et al. (2012) among several families that was reported for abandonment and physical child abuse in Selangor to the District of Social Welfare Department revealed that almost all the respondents stated that the main factor that forces them to abuse the children is financial problem. Due to pressure and stress because of lack of money and lackluster motivation also the great factors of child abuse. United Nations Children's Fund (UNICEF) Malaysia revealed substantial confirmation that higher rates of poverty are one of the leading causes of adolescent impregnation, with teen mothers always ending up either become jobless or in low paid jobs (Hayward, 2011).

Negligence of Parents or Guardian

Neglect has the worst effects on children's development and psychological well-being. It is connected to many weaknesses, disadvantages toward the victims such as intellectual and language difficulties and social communications. Besides it can be in a various term such as educational, emotional, medical and physical (Legano et al., 2009). The study shows that being neglected in childhood may be as harmful as physical and emotional abuse (Rosana et al., 2012).

Illegitimate Child, Stepchild, Adopted Child or Preserved by Others During Childhood

Sedlak et al. (2010) in their research stated that family structure is the most vital risk factor in child abuse where the risk rises when children live with nonbiological parents. Furthermore, foster children are 10 times riskier to be victims of child sexual abuse and unfortunately, they are 20 times likely more possibility to be victims who live with a single mother or father that has a live-in partner.

Alcoholic, Gambler, and Addicts

The other factor stated by respondents was the influence of alcohol from parents. One respondent claimed that when he was in a drunken state, it certainly influenced him to abuse his children physically (Noremy et al., 2012). Gambling addiction is often associated with depression, and depression cannot be controlled quickly and lead to child abuse. Dion et al. (2010) in their research shows numerous rates of sexual abuse committed by pathological gamblers. While Rosana et al. (2012) in their research suggest the increased jeopardy of drug use connected with child physical abuse and concluded that there is a highly consistent association between various of child abuse and drug addicts.

Abuser Suffered Mental Health Problems or Was Formerly   Abused

The other factors that can cause the incidence of child abuse stated by respondents was a mental disorder (Noremy et al., 2012). Ahmad and Mazlan (2014) found in their study that childhood trauma experiences can lead to child abuse. Later, once being a victim, there is a high probability to become an abuser (Santosh, 2016).

Others

The other factors of child abuse cases that stated by Malaysian Department Social Welfare were uncomfortable residence, perpetrator with a hot temper, naughty child, mother remarried, sex maniac, a child with disabilities, involved in crimes. The other factors stated by respondents were home surroundings, a crisis with nearby residents or less of support from other people. Choo et al. (2011) on their recent study found that neighborhood or community environments also contribute to this abuse. Children with disabilities especially those who cannot understand abusive practices, are riskier of sexual abuse (Child Welfare Information Gateway, 2018). Furthermore, children's misbehavior was the leading factors that force to child abuse cases.

ii. Criteria that Contributes to Factors of Child Abuse

Perpetrators

Santhosh (2016) in his research that correlated to the perpetrators of child abuse exposed that every person could be vulnerable to these abuses. Besides, the annual statistic report Department of Social Welfare under the section of children in need of care and protection stated that the perpetrator could be parents, child's partner, caregivers, child's relatives, step-parent or foster parents, and others. Since the perpetrators are not exclusive to a certain character, identity and the relationship status with the victims, this study considered perpetrators as one of the criteria that contribute to child abuse.

Types of Carer Occupations

Social Welfare Department specified in the yearly statistic report of children abuse where there is various kind of carer occupations such as private sector worker, housewife, unemployed, village worker, government servant, caregivers or maid, factory worker, part-time worker, and others. Besides, the results from the annual reports show a positive correlation between the type of carer occupation and abused children as the study shows that various occupation could correlate with child abuse. Thus, this study considered the type of carer occupation.

Gender of The Victims

Choo et al. (2011) in his study recently stated that usually, females stated desertion compared to male. However, males resulted in more physical and emotional abused including sexual abuse. According to the analyst, there is lower exposure to interaction events. Besides, males have a significantly higher prevalence of emotional victimization. In contrast, Fry (2012) in his research stated that global data has determined that almost half of the children from across the country described having experienced severe and frequent physical abuse. While approximately 1 per five of child sexual abuse victims is females and nearly 10 percent of the victims are males. Since many recent studies proved many and different results about the relationship of victim's genders and child abuse, this study considered the gender of victims.

iii. Fuzzy Analytic Hierarchy Process (FAHP)

FAHP provides different decision making levels with numerous criteria to rank alternatives (Fatemeh et al., 2019). When a decision making involved, one of the efficient methods that good in managing data is Fuzzy AHP (Mahmoodzadeh et al., 2007). To handling the incapability of the AHP, Fuzzy AHP comes into practical approach in handling linguistic variables. Moreover, there is a more accurate description of the decision-making process if this approach was used (Kabir & Hasin, 2011).

Besides, Özdağoğlu (2007) stated that FAHP is a fabricated development of Analytical Hierarchy Process which is related to the fuzziness of the decision makers. Furthermore, they also reached the classical AHP is appropriate to make the decision to accurate result if the information is specific, but if the information is uncertainty, the fuzzy logic is fit to determine the decisions.

While Çebi and Karal (2017) stated in their study reveals that FAHP method can be used in students' projects evaluation in education, with more accurate results in the evaluation of projects can be acquired, and more subjectivity in the evaluation process can be decreased. FAHP is a problem-solving method which is the combination of AHP approach use of fuzzy logic and linguistic variables (Erkan & Can, 2014).

METHODOLOGY

This study will use secondary data in collecting data process. This data is collected from the official portal of the Department of Social Welfare, Ministry of Women, Family and Community Development. The data is about the statistic of child abuse cases from every country in Malaysia and collected from the section of Children in Need of Care and Protection. The data is collected by year, state, sex, type of cases, ethnic group, perpetrator, cause of abuse and type of occupations. This research uses Fuzzy AHP approach as the primary methodology to find the criteria weights of the aspects or characteristics and to allocate factors into various types by practicing the data set.

Based on the data collected from the annual statistic report from The Social Welfare Department, there are nine significant factors of child abuse. The factors are a family dispute, followed boyfriend, financial problem, negligence of parents or guardian, illegitimate child or stepchild or adopted child and preserved by others during childhood, alcoholic or gambler or addicts, abuser suffered mental health problems or were formerly abused, unknown and others. The others involve uncomfortable residential, mother remarried, naughty child, hot temper, hyperactive, superstition or tradition, involved in crimes, sex crazy and baby or child with disabilities.

Regarding the observation from the data as mentioned above, three criteria were chosen and selected. The criteria were the perpetrator, type of carer occupations and gender of the child. Most of the perpetrator involves mother, father, child's partner, families, and other people while the type of carer occupations includes private sector worker, housewife, unemployed and others.

The next step is ranking the criteria by using FAHP (Ahyan, 2013).

Step 1

Defined the label and ranking the factors of child abuse. There are nine factors included in this study, and every factor was labelled as C1 until C9 as shown in Table 1. Figure 1 shows the hierarchy of the factors of child abuse ranking.

Table 1: The label of the factors or causes of child abuse

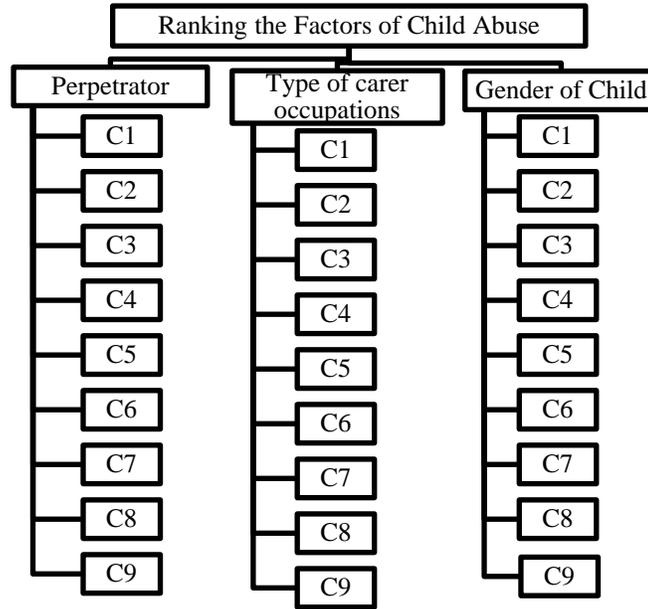| No	Label	Factors of Child Abuse
1	C1	Family dispute
2	C2	Others
3	C3	Followed boyfriend
4	C4	Unknown factors
5	C5	Financial problem
6	C6	Negligence of parents or guardian
7	C7	Illegitimate child, stepchild, adopted child or preserved by others during childhood
8	C8	Alcoholic, gambler and addicts
9	C9	Abuser suffered mental health problems or was formerly abused

Figure 1: Hierarchy of the factors of child abuse ranking

Step 2

Make the comparison of the criteria through the linguistic terms with fuzzy triangular members (Ahyan, 2013). Then, construct Fuzzy triangular scale for the pairwise comparison matrix for every criterion.

$$\tilde{A} = \begin{bmatrix} 1 & \tilde{a}_{12} & ... & \tilde{a}_{1k} \\ \tilde{a}_{21} & ... & ... & \tilde{a}_{2k} \\ \vdots & \vdots & \vdots & \vdots \\ \tilde{a}_{k1} & \tilde{a}_{k2} & ... & 1 \end{bmatrix} = \begin{bmatrix} & Perpetrator & Occupation & Gender \\ Perpetrator & (1,1,1) & (1/9,1/7,1/6) & (1/4,1/3,1/2) \\ Occupation & (6,7,8) & (1,1,1) & (2,3,4) \\ Gender & (2,3,4) & (1/4,1/3,1/2) & (1,1,1) \end{bmatrix} \quad (1)$$

Let Ã represent the k*k-judgment matrix containing triangular fuzzy number $\tilde{a}_{ij}$ for all $i,j \in \{1,2,...,k\}$ is given by equation (1) were $\tilde{a}_{ij} = (l_{ij}, m_{ij}, u_{ij})$ with l_{ij} is lower and u_{ij} is the upper limit and m_{ij} is the most likely value, where we use the geometric mean of l_{ij} and u_{ij} in this paper. So, $m_{ij} = \sqrt{l_{ij} * u_{ij}}$ when $\tilde{a}ij = 1$, it i is equal to j, and $\tilde{a}ij = 1,3,5,7,9$ or it i is not equal to j then $\tilde{a}ij = 1^{-1}, 3^{-1}, 5^{-1}, 7^{-1}, 9^{-1}$.

$\tilde{U}_1$ and $\tilde{U}_2$ assumed as two triangular fuzzy number with $\tilde{U}_1 = (l_1, m_1, u_1)$ and $\tilde{U}_2 = (l_2, m_2, u_2)$. The basic operation $\tilde{U}_1 + \tilde{U}_2 = (l_1 + l_2, m_1 + m_2, u_1 + u_2)$, $\tilde{U}_1 \otimes \tilde{U}_2 = (l_1 l_2, m_1 m_2, u_1 u_2)$ and $\tilde{U}_1^{-1} = \left(\frac{1}{u_1}, \frac{1}{m_1}, \frac{1}{l_1} \right)$. When the respondent is more than one, calculate the average of each value as

$$\tilde{a}_{ij} = \sum_{i=1}^{k} \tilde{a}^k{}_{ij} \Big/ k.$$

Step 3

For every criterion, develop the geometric mean from a fuzzy comparison matrix, $\tilde{g}_i = \prod_{j=1}^{k} \tilde{a}_{ij}$. The summation of the geometric mean values will be multiplied to the power of 1/k where k is the number of criteria used in this study while $\tilde{g}_i$ is denoted as the complete geometric mean values.

Step 4

Determine the values of the fuzzy weight for every criterion. Find the values of the total vector of each geometric mean and the reverse (-1) power of the values first, then determine the fuzzy weight as $\tilde{a}_i = \tilde{U}_i \otimes \left(\tilde{U}_1 + \tilde{U}_2 + ... \tilde{U}_k\right)^{-1}$ and $\tilde{a}_i = \left(l_{ai}, m_{ai}, u_{ai}\right)$.

Step 5

Determine the values of the average of the fuzzy weight of each criterion, v_i and normalized values of the relative weights, n_i.

The average weight for every criterion, v_i was determined by dividing the values of fuzzy weight with 3, since the values l_i, m_i and u_i considered as three variables. Then the v_i calculation is $v_i = \left(l_{ai}, m_{ai}, u_{ai}\right)/3$

. Then normalize the values of the relative weights as $n_i = v_i \Big/ \sum_{i=1}^{k} v_i$.

Step 6

Repeat the above steps to find the ranking for each decision alternatives for each criterion. Hence, multiply each alternatives weight with each criterion weight and select the best result.

RESULTS AND DISCUSSION

The ranking of child abuse criteria can be ranked as shown in Table 2. The weight values were calculated by using six step of FAHP. The numerical was started from pairwise comparison matrix as shown in equation (1). Then, find the geometric mean value, for example of perpetrator criteria: [(1 x 1/8 x 1/4)$^{1/3}$,(1 x 1/7 x 1/3)$^{1/3}$,(1 x 1/6 x 1/2)$^{1/3}$]=(0.31,0.36.0.44). Then, find the total of geometric mean for all criteria: (3.40,4.12,4.87). After that, find the fuzzy weight: [(0.31,0.36,0.44) x (3.40x4.12x4.87)$^{-1}$] =(0.06,0.09,0.13). Lastly, determined the averaged of the fuzzy weight and normalized: (0.06,0.09,0.13)/3=0.09.

The number of the weight of each factor represents the priority value associated with the hierarchy node (Saaty, 1980). Its shows that the type of carer occupations as the first rank as their weight is 0.66 which means 66% contributed to the factors of child abuse in Malaysia. It is followed by the gender of the child contributed 25%. The last criteria was the perpetrator with that considered as the least criteria that contributed 9% to the abuse.

Table 2: The ranking of criteria

Factors	Weight	Ranking
Type of carer occupations	0.66	1
Gender of victim	0.25	2
Perpetrator	0.09	3

Table 3 shows the ranking for child abuse factors based on their weight. Referred to the Table 3, factor C1 which is "family dispute" with the weight value 0.29 is the highest value compared to the other factors. The "family dispute" factor presents 29% contributed as the main factors of the child abuse.

Table 3: The label of the factors or causes of child abuse

Factors	Weight	Ranking
C1	0.29	1
C2	0.22	2
C3	0.13	3
C4	0.12	4
C5	0.09	5
C6	0.06	6
C7	0.04	7
C8	0.03	8
C9	0.02	9

The next ranking were C2-others factor (22%), C3-followed boyfriend (13%), C4-unknown factors (12%), C5-financial problem (9%), C6-negligence of parents or guardian (6%), C7-illegitimate child, stepchild, adopted child or preserved by others during childhood (4%), C8-alcoholic, gambler and addicts (3%) and C9-abuser suffered mental health problems or was formerly abused (2%).

This study found the family dispute becomes the main reasons behind child abuse cases in Malaysia. This finding is also have been supported by Malaysian Department Social Welfare. The department mentioned that 4,583 of the 26,314 child abuse cases recorded from 2013 to November 2019 were due to family disputes. Noremy et al. (2012) in their study found that the financial problems as a main factor that drives them to acts of the abusing the child followed by family crisis factors. Their study was limited at Selangor in year 2012 likely to be the cause of the difference in results.

The finding of this study is expected to help the authorities to take action seriously the case of child abuse. This study also suggests to the Ministry of Women, Family and Community Development to formulate the policies and guidelines for prosperous family in addition to enhanced parenting training and course throughout the country. As their proactive actions hopefully will solving the child abuse problem.

CONCLUSION

In conclusion, the results show that the main factor that contribute to child abuse is family dispute. Many factors can contribute to family dispute such as lack of communication, money matters and argument among family members. Besides, the main criteria that affect this abuse was the carer's occupation.

This study can be improved by adding other alternatives to be ranked by considering its external factors as well. Besides, the sub-criteria are considered in evaluating child abuse cases. Other methods like Fuzzy hybrid AHP-TOPSIS, Fuzzy ELECTRE, Fuzzy hybrid SAW-VIKOR are recommended to be used to study further.

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