Associations Between Demographic Characteristics and Resilience Factors: A Self-Report Survey

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ABSTRACT

Objective: In 2014, Malaysia suffered a severe flood disaster and many people lost their home and belongings. Despite regular flooding in this area, the status of community disaster resilience **(**CDR) is unknown. This paper thus aims to assess the association between demographic characteristics and community disaster resilience factors. **Methods:** A cross-sectional study was completed using the Conjoint Community Resiliency Assessment Measure (CCRAM28) questionnaire six months after the flood event occurred. All selected respondents who met the inclusion criteria were recruited, and IBM SPSS software was used to undertake descriptive and inferential analysis. **Results:** A total of 386 respondents completed the questionnaires. Respondents were mostly female (57%); married (83.9%); with children under 17 years old (58.8%); from villages or rural area (97.2%); living in basic housing (95.6%); of average income; Muslim (97.5%); educated to primary or secondary level (81.1%); and not involved with any community organizations (95.1%), including volunteering, emergency teams, or military service. The mean age was 49 years, and length of time living in the area ranged from 1 to 85 years. CDR scores ranged between medium (2.34- 3.66) and high (3.67- 5.00). An analysis of the results showed that only gender (p = 0.003) and education (p = 0.001) were significantly related to CDR level. Positive and strong correlations were seen between resilience factors, however, particularly leadership (p = 0.001), collective efficacy (p = 0.001); preparedness (p = 0.001); place attachment (p = 0.001); and social trust (p = 0.001). **Conclusion:** The study provides a timely insight into the impact of demographic characteristics and resilience factors in Kelantan, developing the knowledge base needed to create comprehensive, improved community-relevant strategies for the future. This assessment enables top-down initiatives to better understand resilience levels, and this could act as tool to enable the government to prepare communities for future disasters or emergency events.

KEYWORDS: Community disaster resilience, demographic factors, cross-sectional survey

INTRODUCTION

An estimated 1.54 million people were living in Kelantan at the time of the December 2014 floods (1). Khalid and Shafiai (2) claim that those with the fewest resources suffered the greatest impact and had the weakest ability to recover. This acted as a catalyst for the Malaysian Government to review the country's policies in line with the post-2015 Sendai framework for disaster risk reduction (3). Flooding is a natural event, and one that climate change is likely to make even more challenging, making it important to discover information about community perceptions of disaster resilience (4,5). The term "disaster" is used to refer to "a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community to cope using its own resources" (6).

Community resilience is defined as the "existence, development and engagement of community resources by community members to thrive in an environment characterized by change, uncertainty, unpredictability and surprise" (7,8). It can also be seen as the attributes and capabilities that enable an entity to adjust and adapt to adverse forces and to emerge afterward in a positive and functional state (9). Patel et al. (10) found three general types of definition for this: 1) "process" definitions; 2) "absence of adverse effect" definitions ; and 3) "range of attributes" definitions.

The literature identifies a key set of community strengths, including social networks, with their communication, social support, social inclusion, and social capital; leadership; outlooks on life that enable particular lifestyles; and diverse economies that can survive agricultural failures and economic downturns (11,12). The authors of the current paper thus believe that this study is essential to identify what is needed to improve communities' disaster resilience, using the CCRAM28 (13) as evidenced by previous studies (14).

Ethical considerations

The International Islamic University Malaysia (IIUM) Ethics Committee and community leaders have approved this study, to ensure that the study is based on the International Compilation of Human Behavioural Research Standards. Those who volunteered gave their informed consent for the survey, and respondents' anonymity and privacy were ensured by restricting access to the data solely to researchers and only for academic purposes.

METHODS

Design and setting

A cross-sectional design was used to examine relationships among different groups within a

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defined population using large quantities of data (15). A questionnaire survey was distributed to the participants in six areas that were highly affected by the 2014 flood in Kelantan; this was done in 2015, 6 months after the flood event.

Population, participants, and sampling

Kelantan is one of the states with the highest poverty rates in peninsular Malaysia, as well as being the area with the most vulnerability and exposure to natural disasters such as flooding (16,17) (Table 1).

Table 1: Distribution of flood affected population based on area/district in Kelantan

Areas (districts)	Total population *	No. affected	% affected	Sample size
Bachok	76873	120	0.2	
Gua Musang	81204	4452	5.5	56
Jeli	32296	1103	3.4	
Kota Bahru	307904	4390	1.4	
Kuala Krai	99352	7342	7.4	80
Machang	56330	2540	4.5	40
Pasir Mas	177487	14171	8.0	90
Pasir Puteh	112337	887	0.8	
Tanah Merah	112132	5977	5.3	50
Tumpat	142094	9474	6.7	70
Ketereh	151976	No record	-	
TOTAL (Population= 668,599)				386

*Permanent resident/citizenship of Malaysia. Source: Kelantan eBanjir Portal (2015) Shading and italics=the studied communities

The sample size was calculated using the Raosoft Sample Size Calculator (18), which produced a figure of 386 for a confidence level of 95% and a 5% error margin. Respondent inclusion criteria were that participants were flood affected; were over 18 years of age; had a house submerged/partially submerged; had moved to an evacuation centre; and volunteered to participate. Exclusion criteria included people with illnesses such as dementia or with severe mental disabilities. The community for sampling was chosen purposively based on its experience with the flood.

Instrument

The questionnaire consisted of two parts. Part 1 sought demographic characteristics such as location, gender, marital status, education level, age, religion, and income. Part 2 consisted of a modified 5-factor CCRAM (13) focused on the five interacting factors (over 21 items) essential for building disaster resilience: leadership, collective efficacy; preparedness; place attachment; and social trust. CCRAM questions were rated using a 5-point Likert scale ranging from strongly disagree (point 1) to strongly agree (point 5). The Cronbach's alpha was calculated for each CDR factor: leadership (a = 0.91); collective efficacy (a = 0.83); preparedness (a = 0.80); place attachment (a = 0.75); and social trust (a = 0.85) (Table 2). The mean scores were measured based on standard cut-off points (low 1.00 to 2.33, medium 2.34 to 3.66, high 3.67 to 5.00) (19).

Prior to data collection, back-to-back translations (professional) of the instrument into the Malay language were completed, as no Malay instrument was available from previous studies. Pilot testing of the questionnaire was done in a similar sample group to ensure the accuracy, validity, and reliability of the questionnaire when used with participants from this cultural background (15).

Table 2: CCRAM (adapted from Leykin, 2013)[13]

Factor	Items
1. Leadership	General faith in decision makers Specific faith in local leaders Fairness in the way local authority provides services Functioning of the community
2. Collective efficacy	Collective efficacy Support Involvement in community Mutual assistance
3. Preparedness	Family acquaintance with emergency situations Community acquaintance with emergency situations The town's preparedness for emergency situations
4. Place attachment	Emotional attachment to community Sense of belonging Pride in community Ideological identification with community
5. Social trust	Trust Quality of relationship between community members

Data collection and analysis

Data collection took place in the six selected communities over a month period in 2015, 6 months after the flood event (Table 1), and the resulting data was analysed using the IBM SPSS version 20, including complete descriptive analysis (mean, standard deviation (SD), and percentages). Mean scores were measured for CCRM28 and a status (low, medium, or high) for each score determined based on standard cut-off points (low 1.00 to 2.33, medium 2.34 to 3.66, and high 3.67 to 5.00 (19). The inferential analysis was done using one-way ANOVA and Mann Whitney with the level of significance set at $p < 0.05$.

RESULTS

Demographic characteristics

A total of 386 respondents completed the questionnaires. Respondents were mostly female (57%); married (83.9%); with children under 17 years old (58.8%); from villages or rural area (97.2%); living in basic housing (95.6%); of average income; Muslim (97.5%); educated to primary or secondary level (81.1%); and not involved with any community organizations (95.1%), including volunteering, emergency teams, or military service. The mean age was 49 years, and length of time living in the area ranged from 1 to 85 years (arrived in 1930) (mean = 37 years, arrived in 1978). When asked about "type of place of living", respondents differed only slightly, with 381 (98.7%) stating they were from villages, four saying they were from "suburbs" (1%), and one saying "other" (0. 3%) (Table 3).

The five factors measured for perceived community resilience were leadership, collective efficacy, preparedness, place attachment, and social trust. The overall results based on the cut off points for the mean score for each factor show medium and high levels of community resilience. This indicates strong and positive resilience for each factor (Table 4).

Table 3: Frequency distribution of participant characteristics (N=386)

Demographics characteristic		Frequencies	%
1- Gender			
	Male	175	45.3
	Female	211	54.7
2- Living Area			
	Village	375	97.2
	Town	4	1.0
3- Housing Types			
	Housing Area	7	1.8
	Terraced House	2	0.5
	Basic House	369	95.6
	Mobile Home	2	0.5
	Others	13	3.4
4- Organization Involvement			
	Yes	19	4.9
	No	367	95.1
5- Marital Status			
	Single	25	6.5
	Married	324	83.9
	Widow	37	9.6
6- Children			
	No	35	9.1
	Not living together	47	12.2
	Below 17 years old	227	58.8
	Above 17 years old	77	19.9
7- Disability – yes			
	Physical	21	3.4
	Mild Mental	6	1.6
	Elderly	70	18.1
8- Dependants (other than children) – yes			
	Disabled (OKU)	24	6.2
9- Education level			
	Primary school	138	35.8
	Secondary school	175	45.3
	Certificate	30	7.8
	Academic	6	1.6
	Other	37	9.6
10- Religion			
	Islam	377	97.5
	Buddha	8	2.2
	Other	1	0.3
11- Level of belief (religion)			
	Circular	106	27.5
	Traditional	121	31.3
	Strong	138	35.8
12- Income/living expenses			
	Below average	74	19
	Average	216	56
	Above average	97	25
- Foodstuff & drink during & after disaster:		292	75.6
-Safety devices or equipment: Yes		317	82.1
-First aid and medication: No		224	58
13- Working	Yes	217	43.8
	No	169	56.2
14- Emergency disaster experience	Yes	238	43.8
	No	148	38.3
15- Injury during emergency disaster	Yes	23	6
	No	363	94
16- Involved in volunteering activities	Yes	34	8.8
	No	352	91.2
17- Involved in emergency team	Yes	12	3.1
	No	374	69.9
18- Serving in military/National service	Yes	6	1.6
	No	380	98.4

Community disaster resilience scores

Associations between demographic factors and community disaster resilience

The Mann-Whitney test was used to compare the CDR scores between male and female participants. The results showed that the effect of gender was statistically significant and female participants' scores were statistically higher than those of the male participants (Mann-Whitney U = 15056, p-value = 0.003). The non-parametric Mann-Whitney test was chosen because the normality assumption was not met by the data [20].

Of living area, marital status, age, gender, income, religion, and education, only gender (p = 0.003) and education level (p = 0.001) were significantly related to CDR level ($X^2(4)$ = 18.623; p = 0.001). The p-values for living area, marital status, religion, and income status were 0.792, 0.856, 0.538, and 0.541, respectively (Table 5).

Associations between resilience factors

A correlation test was used to calculate the monotonic relationships between leadership, collective efficacy, preparedness, place attachment, and social trust with respect to community disaster resilience score. The Spearman's Rank Correlation Coefficient was used to define the strength and direction of the interactions between leadership, collective efficacy, preparedness, place attachment, and social trust, and data transformation carried out after an abnormal distribution was detected (Table 6). However, the skewness for social trust remained above 2 (2.619).

Table 4: Community Resilient Level (CCRM28)

Factor	Item content	Mean	Cut Off Point
Leadership	1- The municipal authority functions well.	3.27	Medium
	6- I trust the local decision makers	3.81	High
	11- In my community, appreciate attention is given to the needs of children	4.38	High
	15- I have faith in my mayor's ability to lead the transfer from routine to emergency management.	3.47	Medium
	19- The municipal authorities fairly provide services	3.63	Medium
	21- The residents of my community will continue to receive municipal services even in an emergency situation.	3.94	High
Collective Efficacy	2- There is mutual assistance and people care for one another	4.15	High
	7- I can count on people in my community to help me in a crisis situation	4.07	High
	12- In my community, there are people who can help me to cope with the emergency situation.	4.03	High
	16 I have faith in my community's ability to overcome an emergency situation	3.98	High
	20- The residents are greatly involved in the community's activities	4.05	High
Prepared-ness	3- My community is prepared for an emergency situation	3.49	Medium
	8- Residents are aware of their roles in the emergency situation	3.99	High
	13- There are sufficient facilities for public protection(eg shelters, etc.) in my community	3.45	Medium
	17- My family and I are acquainted with the emergency system in my town	3.87	High
Place Attachment	4-I am proud to tell others where I live	4.01	High
	9-I have a sense of belonging to my community	4.19	High
	14-I remain in my community for ideological reasons	3.3	Medium
	18-I would be sorry to leave the town where I aside	3.96	High
Social Trust	5-Good relationships exist between various group	4.16	High
	10-Residents in my community trust each other	4.11	High

Table 5: Community disaster resilience score based on Gender

Variable	Mean rank	Z-statistics	P-value
Male (n=175)	207.96	-2.985	0.003
Female (n=211)			

Table 6: Normality test of sample distribution; skewness and kurtosis (transformed)

Variable	Skewness		Kurtosis	
	Statistic	Std. Error	Statistic	Std. Error
Community Disaster Resilience	0.700	0.125	4.872	0.249
LgLeadership	-0.249	0.125	4.817	0.248
LgCollective Efficacy	0.260	0.125	13.290	0.248
LgPreparedness	0.589	0.124	10.170	0.248
Place Attachment	-0.211	0.125	-0.444	0.248
LgSocial Trust	2.619	0.124	38.046	0.248

N = 386

Pearson's correlation coefficient was thus used to test for linear relationships between the independent variables and to detect the existence of multicollinearity between variables. Positive and strong correlations were seen to exist between all variables and CDR factors. Leadership had a strong relationship and a significant correlation with CDR, r = 0.690; p = 0.001; Collective efficacy had a strong relationship and a significant correlation with CDR, r = 0.740; p = 0.001); Preparedness had a strong relationship and a significant correlation with CDR, r = 0.669; p = 0.001); Place attachment had a strong relationship and a significant correlation with CDR, r = 0.619, p = 0.001; and Social trust also had a strong relationship and a significant correlation with CDR, r = 0.534, p = 0.001.

DISCUSSION

This paper demonstrates the ability to measure and assess community resilience using a simple tool designed for that purpose. It establishes a baseline community portrait which could later serve as a reference point for this community's capacity to cope with emergencies.

Demographic characteristics

The phenomenon of females scoring statistically higher than males for CDR supports an earlier study by González-Torres and Artuch-Garde (21), which stated that women had an advantage over men in several aspects of coping: seeking help to solve problems; expressing their feelings; analysing causes and possible consequences; learning from past situations; establishing action plans

and which steps to take; seeking help from a professionals; preparing for the worst; communicating feelings; and seeking alternative reinforcement. All of these aspects are related to the Leadership factor of CDR, supporting the idea that gender is related to CDR.

The finding that education level was the only other demographic variable to demonstrate a significant relationship with CDR both supports and contradicts a previous study by Bonanno and colleagues (22, 23), which stated that univariate analysis associated higher levels of education with greater levels of resilience. However, while confirming the relationship between education level and CDR, in this study, when other demographic factors such as exposure, resources, and life stress were statistically controlled for, education was *inversely* associated with resilience; in other words, participants with a college education were almost half as likely as those with only secondary education to be resilient. This suggests that, in the population studied, higher education levels impede CDR in terms of adaptation to trauma.

Living area displayed no significant relationship with CDR, which was to be expected as almost all (n=371) participants lived in the same type of area (villages). This variable was investigated because Juul (24) stated that relationships between villages seemed strong and were strengthened by cross-linkage kinship systems that created strong social capital, and a sense of social cohesion and common purpose, qualities known to add to collective efficacy (25), which did display a high positive correlation with levels of CDR in this study.

Similar to living area, religion was found to have no significant relationship with CDR, possibly because almost all participants declared Islam as their religion (n=377). In this case, researchers expected participants to perceive their level of CDR as being high due to the strong Muslim moral qualities of Qada and Qadr, which require adherents to accept any circumstances that befall them (26).

The final demographic factor in the study, income level, was also shown to have no relation to CDR, supporting the findings of earlier studies which stated that income level rarely explains resilience variance (27-28). In contrast, however, loss of income remained a significant predictor of resilience, even when other socioeconomic and demographic variables were controlled for (27,28). One previous study found that people with stable income were more prepared than others because people with higher incomes lived in more disaster-resistant areas while the reverse was true for people with lower incomes (29).

Resilience factors and their associations with community resilience

Strong positive correlations were found between the five surveyed factors and CDR. This finding supports Cohen et al. (30) and various other studies that also found that community resilience factors showed positive correlations with each other, reflecting the studied community's overall capability to face disaster and recover from it.

Leadership during a disaster orients and influences the success or failure of crisis and disaster management, particularly in relation to preventive and planning phases (31). Leadership can also be linked with other sociological concepts such as gender, socialisation, culture, social relationships, and organisational processes, which may affect leaders' abilities to collaborate, which is a vital element for the implementation of best practice in terms of crisis handling, disaster management, and disaster resilience (31). Good governance is perceived as a core element of community resilience (32) and plays a key role across different disciplines dealing with resilience (33-35) that have used the Malaysian floods as a case study in governance. Trust is inherent in effective leadership because it enables more informal relationships during non-critical times (35), and these may then facilitate trusting interactions during response to disasters. Gazley (36) suggests measuring trust and behavioural norms in public–private partnerships to promote understanding of the way informal partnerships are managed.

It has been documented that a crisis is usually followed immediately by a rise in mutual support and solidarity (37); thus, intervention plans can be devised based on the assumption that the population will generally be willing to help. This implies that collective efficacy may not only contribute to a society's initial strength and resilience but may also help to support and enhance recovery measures. In the last decade, several studies have shown the potential intrinsic value of involving communities in collective efficacy to increase the effectiveness of disaster preparedness (38). Research proposing the involvement of all potential players in disaster prevention and risk mitigation, including both specialist organizations and community members, supports collective efficacy and social trust (39).

Preparedness involves families and communities becoming acquainted with potential emergency situations and is affected by the population's perception of their preparedness to survive and recover from a disaster. The World Health Organization-supported Hyogo framework for building resilient communities considers preparedness to be a key component (40), and this is associated with leadership and authority at the local level. According to Chang et al. (41) resilient infrastructure systems, particularly "lifeline" services, are crucial to minimise the societal impact of extreme events; if one system fails, all are likely to fail. At the microeconomic level, resilience is boosted by preparedness activities such as reinforcing buildings, conserving resources, and leveraging flexible technologies to better identify alternative sources of supply when local outlets are affected (35).

Attachment to place is a phenomenon that incorporates various aspects of bonding between people and places, and involves the interplay of emotions, knowledge, and beliefs, along with behaviours and actions in reference to a place (42).

Castleden, McKee, and Murray (33), while recognizing the possibility of trust leading to exploitation, note that if people trust in one another, they signal constructive intent to others, thereby inviting cooperation and mutually beneficial action. Positive correlations between community resilience and social trust have been found by a number of different studies (14).

CONCLUSION

The findings of the current study, which provides a portrayal of six communities' resilience profiles based on a one-time measurement of community resilience during a post-emergency period, has confirmed certain factors as important for CDR in different demographic settings, a finding that will be useful as a guide to planning for CDR in non-similar communities globally. It has confirmed that the CCRAM28 is associated with a high level of perceived CDR and can therefore be considered a good predictor of CDR, not only in the specific Malaysian setting but also elsewhere. However, despite this finding, the actual predictive value of the CCRAM28 in the case of disasters is yet to be ascertained.

This study's confirmation of specific individual demographic factors (gender and education level) and other factors that have an impact on CDR levels provides a guide for communities and governments, in this case the flood affected Kelantanese communities and the Malaysian Government, to focus greater attention on these factors when designing and implementing improved community-based disaster resilience and recovery programmes and policies. However, they should not discount those factors that did not appear to have an impact. The study results emphasise the importance of considering the impact on CDR of site-specific demographic factors, such as education level; in some places, higher education levels may be positively correlated with CDR, while in others, as in this study, lower education levels may be positively correlated with CDR. The study has also demonstrated the value of the Malay translated CCRAM28 as a tool in assessing levels of perceived CDR

LIMITATIONS

Respondents' difficulties in understanding the questionnaire were minimised by the provision of assistance in answering the questions and by the questionnaires being translated into Malay. The other limitation in relation to collecting information was the lack of available baseline information about the community's cohesion and resilience before the disaster, caused by the fact that the project was an ad hoc project following a disaster event. To overcome this limitation, the researchers used data from population office as a guideline as well as utilising previous studies to make comparisons.

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CONFLICT OF INTEREST

The authors have no conflict of interest to declare with regard to this work.

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