



Assessing perceived dengue risk, attitude, and prevention practices in Barangay Buhangin Proper, Davao City

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Abstract. Dengue remains a significant public health issue in the Philippines and globally. This study aimed to evaluate the risk perception, attitude, and prevention practices of Barangay Buhangin Proper residents while examining whether socio-demographic profiles significantly influenced these factors. The objective was to develop strategic community health interventions. A total of 584 residents participated in face-to-face interviews using an adapted risk perception, attitude, and practice questionnaire. The results show that residents demonstrated good risk perception (51.49, cut-off = 51.20) and attitude (43.62, cut-off = 38.40), but exhibited poor practice (47.22, cut-off = 57.60). The study also revealed that females (OR = 1.493, 95% CI = 1.016-2.194, $p = 0.041$), college graduates (OR = 0.653, 95% CI = 0.273-1.561, $p = 0.041$), and employed individuals (OR = 0.654, 95% CI = 0.441-0.970, $p = 0.034$) were statistically associated with good risk perception while being married (OR = 0.699, 95% CI = 0.318-1.714, $p = 0.038$) was associated with a positive attitude. However, no

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socio-demographic factors were linked to good practice, indicating that the issue with practices persists regardless of profile. Furthermore, weak positive correlations were observed between risk perception and attitude ($r = 0.266$, $p < 0.001$), risk perception and practice ($r = 0.092$, $p < 0.027$), and attitude and practice ($r = 0.144$, $p < 0.001$). Despite awareness of risks and having positive attitudes, the community struggles to maintain effective practices due to complacency, self-serving behaviour, and inadequately targeted interventions. This study recommends implementing tailored interventions to address the root causes and effectively combat dengue

Keywords: socio-demographic profile; development of community health interventions; modifiable factors in dengue progression; change mechanisms for dengue prevention; implementing change mechanisms

Introduction

Dengue cases are increasing rapidly worldwide and represent the most common mosquito-borne viral infection in humans. Despite continuous advancements in health interventions, it remains a significant public health concern [1, 2]. Dengue is caused by the dengue virus (DENV), which is transmitted by infected female mosquitoes, primarily *Aedes aegypti* and, to a lesser extent, *A. albopictus*. Transmission occurs from person to person through mosquito bites. Symptoms include the sudden onset of high fever, muscle and joint pain, loss of strength, pain behind the eyes, skin rashes, nosebleeds after the fever subsides, stomach pain, coffee-coloured vomit, black stools, and difficulty breathing [3].

Dengue cases are underreported globally, and there has been more than a fifteen-fold increase in cases reported to the WHO, from 505,430 in 2000 to 7.6 million in 2024 [2]. In May 2024, the Philippines recorded approximately 59,267 cases, which is higher than the 45,722 cases reported during the same period last year [4]. Locally, the Davao Region is one of the 17 dengue-endemic areas in the Philippines and recorded 9,073 cases as of June 22, 2024, an increase from 7,199 cases in the same period in 2023. Davao City accounted for 2,192 dengue cases in June 2024, which represented more than 24% of the region's total of 9,073 cases [5].

With the continuous rise in dengue infections in the Philippines, the Department of Health (DOH) developed the Dengue Prevention and Control Program to reduce the burden of dengue disease, as outlined in DILG MC No. 2012-16. This programme emphasises the surveillance of dengue cases through various government agencies, case management and diagnosis through extensive dengue clinical management training for hospitals, and the establishment of dengue confirmatory tests [6]. However, according to E.P. Ong *et al.* [7], the programme has not met its objectives, primarily due to the lack of community engagement in taking responsibility for combating dengue.

A study by S. Sulistyawati *et al.* [8] on dengue vector control through community empowerment in Yogyakarta, Indonesia, revealed that most participants adopted practices that raised awareness about the presence of larvae in water containers. These practices included cleaning and brushing containers, as well as cleaning them one to three times per week. The use of repellents, mosquito coils, or sprays in the morning and evening was also noted.

Additionally, a study by C. Aerts *et al.* [9] on the importance of disease knowledge and risk perception in shaping preventive behaviour for selected vector-borne diseases in

Guyana showed that prevention strategies were employed more frequently among individuals with higher levels of education. Education significantly enhanced knowledge and understanding of dengue and malaria. Furthermore, the study highlighted the importance of raising awareness about the risks and making preventive measures more accessible to avoid decreased risk perception, which could lead to lower levels of preventive activity.

In addition, the study by V.R.D.M. Herbuela *et al.* [10] proposes two comprehensive health initiatives that will help individuals effectively apply their knowledge and attitudes to improve their practices. Health initiatives should focus on changing behaviour to translate information and perspectives into more effective strategies against dengue fever. Several initiatives continue to prioritise education and awareness campaigns over physical activity initiatives, which are more effective in influencing behaviour.

According to A.B. Siddique *et al.* [11], the findings highlight an increased perceived risk and a significant discrepancy in practices, revealing key influences such as gender, educational attainment, employment status, sufficient sleep duration, and the father's occupation. The study emphasises the urgent need for targeted public health initiatives to raise awareness and encourage proactive participation in dengue prevention, particularly among young people, who play a crucial role in shaping a community's response to viral illnesses.

E.R. Gregorio *et al.* [12] also found that, despite existing dengue programmes and policies, as well as Filipinos' high awareness of the disease, dengue remains a persistent issue with increasing case rates. To achieve a dengue-free Philippines, key themes should be prioritised, and actions should be adapted to more effectively reach and impact the target audience.

At present, no data is available on the risk perception, attitudes, and practices (RPAP) of residents in Davao City concerning dengue infection. Understanding the RPAP of residents is crucial, as it will help uncover the root causes of the problem within the community. Despite numerous initiatives and activities aimed at addressing the issue, the number of cases continues to rise due to a lack of community collaboration. Therefore, this study aimed to thoroughly assess the RPAP of residents, identify potential causes for the increasing number of dengue cases and provide valuable guidance to public health officials and policymakers involved in combating the disease.

Materials and Methods

The researchers identified the research locale based on epidemiological data obtained from the Department of Health – Davao City, following the trend in dengue cases since 2018. Barangay Buhangin Proper was selected as the locale, as it was also classified as a dengue hotspot, having exceeded the local epidemic threshold [13, 14]. The sample size was then determined using Cochran's formula:

$$\text{Sample size for known population} = \frac{\frac{z^2 \times p(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p(1-p)}{e^2 N}\right)}, \quad (1)$$

where N – the population size; z – the z-score; e – the margin of error; p – the standard deviation. The initial sample size calculation was 382 individuals, based on a 5% margin of error. However, to minimise the design effect, 584 individuals were included in the study. Respondents were selected using two-stage random cluster sampling from nine (9) *puroks* in Barangay Buhangin Proper, Davao City, between April and May 2023.

The adapted RPAP questionnaire by M.I.A. Zamzuri *et al.* [15] was validated. Both the questionnaire and the Informed Consent Form (ICF) were translated by a *Bisaya* linguist to eliminate any language barriers for the respondents. The translated questionnaire then underwent content validity and reliability testing, administered to 30 randomly selected participants not included in the target population. The results were analysed using Cronbach's Alpha values, calculated through the Reliability Analysis Test in IBM SPSS Statistics 21 software, yielding internal consistency values ranging 0.701-0.855.

Before conducting the survey, the researchers briefed the assigned personnel on the dissemination of the questionnaires, including the purpose and agenda of the study, with particular emphasis on the correct procedure for selecting respondents. The researchers, along with the designated *barangay* personnel and BHWs, were then deployed to the nine (9) randomly selected *puroks* to conduct the survey simultaneously. The sampling criteria included allowing only one representative per household to complete the questionnaire. Eligible participants were permanent residents who had lived in Barangay Buhangin Proper, Davao City, for six (6) months or more, who could read and write, were physically and mentally fit, were not members of the indigenous community, had or had not had a history of dengue infection, and were 18 years of age or older. Excluded from the study were minors (17 years and below), transient residents who had lived in the area for less than six (6) months, those unable to read or write, individuals with compromised physical or mental health, and members of the Indigenous community.

Before distributing the questionnaires, the researchers and *barangay* personnel explained the study, its goals, and its purpose to ensure respondents fully understood their involvement and how their participation would contribute to the research. The researchers and *barangay* personnel then asked respondents to sign the ICF, indicating their voluntary

participation in the study. Only those who signed the consent form were included. Once participation was confirmed, a two-part questionnaire was distributed face-to-face.

The first part of the questionnaire gathered socio-demographic information, such as age, sex, civil status, educational attainment, employment status, monthly income, type of residential building, and history of dengue. The second part consisted of a 23-item questionnaire. Questions 1-8 focused on risk perception, which assessed the dangers that pose short- or long-term risks to the community. Risk perception refers to the subjective judgment made by respondents regarding dengue as a threat to health and well-being. For example, questions on this scale included: "Dengue fever can cause death; Fever lasting for 3 days is concerning to me. I feel that I cannot wait up to 5 days to seek treatment; I have many close friends who have recovered from dengue fever, but I am still afraid of dengue; and I need a lot of money to implement dengue prevention at home." etc.

Questions 9-14 addressed attitudes, which evaluate ways of thinking reflected in people's behaviour and how these directly affect their daily lives. Attitudes are shaped by respondents' past experiences with dengue and determine their actions towards the disease. For example, some questions included: "If at least one person in the household is knowledgeable about the disease, they can help prevent it in the home; It is necessary for me to share information about dengue fever with my family members; and I become more interested in participating in dengue control/prevention when there is cooperation within the neighbourhood." etc. Additionally, questions 15-23 related to practices, referring to actions repeatedly performed that establish a shared identity within the community. These questions focused on how the community takes action to prevent the spread of dengue. For example, questions on this scale included: "I use mosquito repellent (lotion/spray/coil); I always keep water containers in my house tightly sealed; and I add larvicide to water storage to kill mosquito larvae." etc.

The RPAP questionnaire was answered using an 8-point Likert scale, ranging from 1 = strongly disagree to 8 = strongly agree. The cumulative scores for risk perception, attitude, and practice ranged from 8 to 64, 6 to 48, and 9 to 72, respectively. To ensure the utmost anonymity and confidentiality of respondents, instead of asking for names, a reference number was assigned to each questionnaire.

All gathered information was stored in Google Drive by Google™ and organised into specific folders. Hard copies of the consent forms, questionnaires, field notes, or informal jottings were categorised and securely stored. Access to these materials was strictly limited to the study's proponents. All saved raw data and hard copies will be stored from 2023 to 2025, after which they will be destroyed to render them inaccessible. The researchers guarantee that no files or remaining data will be retained, and all information will be permanently deleted.

The data collected were encoded into Google Sheets by Google™ and were double-checked to ensure accuracy and repeatability. After this, the socio-demographic profile and

scores from the RPAP questionnaire were imported into IBM® SPSS® Statistics 21 software for descriptive and inferential statistical analyses. Descriptive statistics were used to obtain frequencies and percentages for the socio-demographic profile, and the mean was calculated for each question in the RPAP questionnaire. Total scores were calculated for each RPAP scale, and scores were classified as good or poor based on the 80% cut-off point.

The Pearson Chi-Square Test was used to interpret and compare the socio-demographic profiles with RPAP, categorising the profiles as either good or poor. In addition, the RPAP of the respondents regarding dengue infection was analysed using multivariate logistic regression to obtain the odds ratio/likelihood of each socio-demographic profile displaying good or poor RPAP. Using the Pairwise Correlation Table, cross-tabulations were calculated between respondents' risk perception, attitude, and practice to assess significant relationships. The significance of all analyses was tested at the 0.05 level.

Lastly, the development of community health interventions was guided by the pragmatic Six Steps for Quality Intervention Development (6SQuID) framework, originally developed by D. Wight *et al.* [16] and validated by L. Tirman *et al.* [17]. First, the problem and its causes, based on the risk perception, attitudes, and practices of Barangay

Buhangin Proper residents concerning dengue infection, were defined and understood. The next step was to identify which of the primary or underlying factors shaping the problem had the most significant scope for change. Furthermore, the most promising modifiable causal factors were identified, and mechanisms for addressing them were formulated. With these change mechanisms in place, the fourth step involved determining the most effective ways to deliver them.

This study underwent thorough examination and approval by the San Pedro College Research Ethics Committee (Protocol No.: 2023-0056). All procedures conformed to the standards for research involving human participants, such as those outlined in the Helsinki Declaration [18]. Respondents read the ICF and provided consent prior to participating in this study.

Results

Of the 584 respondents, the majority were 38-47 years old (23.1%, $n = 135$), 69.2% ($n = 404$) were female, 51.9% ($n = 303$) were married, high school graduates (45.2%, $n = 264$), 51.2% ($n = 299$) were unemployed, 44.7% ($n = 261$) had monthly incomes less than PhP 5,000.00, lived in a single house/bungalow (65.9%, $n = 385$), and 88.9% ($n = 519$) of the respondents declared no history of dengue (Table 1).

Table 1. Socio-demographic profile of respondents in the study

Profile	No. of respondents (n = 584)	Percentage (%)	
Age group	18-27 years	106	18.2
	28-37 years	113	19.3
	38-47 years	135	23.1
	48-57 years	117	20.0
	>57 years	113	19.3
Sex	Male	180	30.8
	Female	404	69.2
Civil status	Single	208	35.6
	Married	303	51.9
	Widow/Divorcee	68	11.6
	Others	5	0.9
Highest educational attainment	Elementary graduate	52	8.9
	High school graduate	264	45.2
	Senior high school graduate	43	7.4
	College graduate	180	30.8
	Graduate degree acquired	16	2.7
	Others	29	5.0
Employment status	Employed	285	48.8
	Unemployed	299	51.2
Monthly income (range in PhP)	<5,000	261	44.7
	5,000-9,999	128	21.9
	10,000-14,999	85	14.6
	15,000-24,999	66	11.3
	>25,000	44	7.5
Type of residential building	<i>Kubo</i> or <i>Payag</i>	105	18.0
	Single house/Bungalow	385	65.9
	Apartment	56	9.6
	Multi-unit building (e.g., Dormitory)	27	4.6
	Condominium	0	0.0

Profile	No. of respondents (n = 584)	Percentage (%)
Commercial building	11	1.9
History of dengue		
Yes	65	11.1
No	519	88.9

Source: compiled by the authors

On the other hand, as seen in Table 2, it was found that age ($p < 0.001$) was a significant determinant for risk perception, where those 38 years old and above (19.7-28.7%) tend to have good risk perception regarding dengue infection. In addition, for sex ($p = 0.016$), females lean towards having better risk perception than males. Furthermore, civil status ($p < 0.001$) affects risk perception, where it was found that being married (60.0%) contributes to having good risk perception. Moreover, educational attainment ($p < 0.001$) was a significant determinant, where high school (45.0%)

and college (35.7%) graduates exhibit good risk perception compared to other levels. All other variables revealed insignificant associations with risk perception. Moreover, in terms of attitude, only educational attainment ($p = 0.038$) was found to be a significant determinant, with a high proportion of respondents who are high school (44.2%) and college graduates (32.9%) exhibiting a good attitude compared to other levels of educational attainment. Lastly, it was found that all socio-demographic profiles are not significant determinants of practice.

Table 2. Distribution of participants according to risk perception, attitude, and practice (n = 584)

Variable	Risk perception			Attitude			Practice		
	Poor n (%)	Good n (%)	p-value	Poor n (%)	Good n (%)	p-value	Poor n (%)	Good n (%)	p-value
Age group			<0.001			0.315			0.096
18-27	71 (25.0)	35 (11.7)		17 (21.5)	89 (17.6)		72 (17.4)	34 (19.9)	
28-37	58 (20.4)	55 (18.3)		18 (22.8)	95 (18.8)		78 (18.9)	35 (20.5)	
38-47	49 (17.3)	86 (28.7)		12 (15.2)	123 (24.4)		88 (21.3)	47 (27.5)	
48-57	52 (18.3)	65 (21.7)		19 (24.1)	98 (19.4)		84 (20.3)	33 (19.3)	
>57	54 (19.0)	59 (19.7)		13 (16.5)	100 (19.8)		91 (22.0)	22 (12.9)	
Sex			0.016			0.223			0.354
Female	183 (64.4)	221 (73.7)		50 (63.3)	354 (70.1)		281 (68.0)	123 (71.9)	
Male	101 (35.6)	79 (26.3)		29 (36.7)	151 (29.9)		132 (32.0)	48 (28.1)	
Civil status			<0.001			0.184			0.135
Single	123 (43.3)	85 (28.3)		30 (38.0)	178 (35.2)		138 (33.4)	70 (40.9)	
Married	123 (43.3)	180 (60.0)		35 (44.3)	268 (53.1)		216 (52.3)	87 (50.9)	
Widow/Divorcee	37 (13.0)	31 (10.3)		14 (17.7)	54 (10.7)		55 (13.3)	13 (7.6)	
Others	1 (0.4)	4 (1.3)		0 (0.0)	5 (1.0)		4 (1.0)	1 (0.6)	
Highest educational attainment			<0.001			0.038			0.104
Elementary graduate	28 (9.9)	24 (8.0)		5 (6.3)	47 (9.3)		42 (10.2)	10 (5.8)	
High school graduate	129 (45.4)	135 (45.0)		41 (51.9)	223 (44.2)		188 (45.5)	76 (44.4)	
Senior high school graduate	35 (12.3)	9 (2.7)		9 (11.4)	34 (6.7)		34 (8.2)	9 (5.3)	
College graduate	73 (25.7)	107 (35.7)		14 (17.7)	166 (32.9)		115 (27.8)	65 (38.0)	
Graduate degree acquired	8 (2.8)	8 (2.7)		4 (5.1)	12 (2.4)		11 (2.7)	5 (2.9)	
Others	11 (3.9)	18 (6.0)		6 (7.6)	23 (4.6)		23 (3.5)	6 (5.6)	
Employment status			0.371			0.404			0.935
Employed	144 (50.7)	141 (47.0)		42 (53.2)	243 (48.1)		202 (48.9)	83 (48.5)	
Unemployed	159 (49.3)	140 (53.0)		37 (46.8)	262 (51.9)		211 (51.1)	88 (51.5)	
Monthly income			0.108			0.275			0.704
Less than 5,000	141 (49.6)	120 (40.0)		40 (50.6)	221 (43.8)		185 (44.8)	76 (44.4)	
5,000-9,999	62 (21.8)	66 (22.0)		18 (22.8)	110 (21.8)		91 (22.0)	37 (21.6)	
10,000-14,999	37 (13.0)	48 (16.0)		13 (16.5)	72 (14.3)		63 (15.3)	22 (12.9)	
15,000-24,999	28 (9.9)	38 (12.7)		6 (7.6)	60 (11.9)		42 (10.2)	24 (14.0)	
More than 25,000	16 (5.6)	28 (9.3)		2 (2.5)	42 (8.3)		32 (7.7)	12 (7.0)	
Type of residential building			0.426			0.482			0.471
Kubo or Payag	53 (18.7)	52 (17.3)		20 (25.3)	85 (16.8)		74 (17.9)	31 (18.1)	
Single house/Bungalow	186 (65.5)	199 (66.3)		48 (60.8)	337 (66.7)		278 (67.3)	107 (62.6)	
Apartment	31 (10.9)	25 (8.3)		7 (8.9)	49 (9.7)		39 (9.4)	17 (9.9)	

Continued Table 2

Variable	Risk perception			Attitude			Practice		
	Poor n (%)	Good n (%)	p-value	Poor n (%)	Good n (%)	p-value	Poor n (%)	Good n (%)	p-value
Multi-unit building	11 (3.9)	16 (5.3)		3 (3.8)	24 (4.8)		16 (3.9)	11 (6.4)	
Commercial building	3 (1.1)	8 (2.7)		1 (1.3)	10 (2.0)		6 (1.5)	5 (2.9)	
History of dengue			0.372			0.642			0.244
Yes	35 (12.3)	30 (10.0)		10 (12.7)	55 (10.9)		50 (12.1)	15 (8.8)	
No	349 (87.7)	270 (90.0)		69 (87.3)	450 (89.1)		363 (87.9)	156 (91.2)	

Source: compiled by the authors

Based on the 80% cut-off point, the respondents of Barangay Buhangin Proper had a good risk perception, with a total score of 51.49. It was found that there is a strong emphasis among respondents that dengue can cause death (\bar{x} = 7.48). Furthermore, seeking immediate medical intervention when fever is persistent (\bar{x} = 6.69), investing money to live in a dengue-free household (\bar{x} = 6.51), and ensuring there are no breeding spots around the house are all considered highly important (\bar{x} = 7.46) (Table 3). Additionally, it was found that respondents agree that intrapersonal, interpersonal, and community factors play a role in developing a good risk perception, such as learning from the experiences of recovered individuals and being involved in community efforts for dengue prevention, both having a mean of 6.63. In addition, the respondents display a slight agreement that there is a need for financial stability when it comes to the success of the implementation against dengue (\bar{x} = 5.14). However, respondents also slightly agree that prioritising other responsibilities contributes to having less time for dengue prevention practices (\bar{x} = 4.95).

Table 3. Details of the mean scores for risk perception questions

Question No.	Mean (\bar{x})	Interpretation
1	7.48	Agree
2	6.69	Agree
3	6.63	Agree
4	6.51	Agree
5	7.46	Agree
6	6.63	Agree
7	5.14**	Slightly Agree
8	4.95**	Slightly Agree
Total score	51.49*	Good

Notes: * – total score interpretation as “Good” or “Poor” is based on an 80% cut-off point [15] (Total mark = 64, 80% cut-off point = 51.2); ** – negatively-worded questions use reverse scoring [19]

Source: compiled by the authors

In Table 4, it can be observed that the respondents of Barangay Buhangin Proper had a good attitude with a total score of 43.62, based on an 80% cut-off point. Generally, the residents’ attitudes indicate that the risk of contracting dengue is lessened when at least one person is knowledgeable about the disease in the household

(\bar{x} = 6.93). Furthermore, it was found that it is necessary to convey information about dengue fever to family members, ensure that old and unused containers are kept closed, and that drainage or water flow systems are properly maintained, with means of 7.44, 7.44, and 7.31, respectively. Moreover, the respondents agree that interest in performing dengue control or prevention interventions depends on the cooperation of other households (\bar{x} = 6.98). Additionally, the respondents place a strong emphasis on the necessity of disposing of rubbish in designated locations, with a mean of 7.52.

Table 4. Details of the mean scores for attitude questions

Question No.	Mean (\bar{x})	Interpretation
9	6.93	Agree
10	7.44	Agree
11	6.98	Agree
12	7.44	Agree
13	7.31	Agree
14	7.52	Strongly Agree
Total score	43.62*	Good

Notes: * – total score interpretation as “Good” or “Poor” is based on an 80% cut-off point [15] (Total mark = 48; 80% cut-off point = 38.40)

Source: compiled by the authors

Based on an 80% cut-off point, as seen in Table 5, the respondents exhibit poor practice with a total score of 47.22. It was discovered that the respondents moderately agreed with the use of mosquito repellent in the form of lotion, spray, or coil to prevent dengue infection (\bar{x} = 6.35). Furthermore, the respondents agreed that it is essential to keep water containers in their houses tightly closed (\bar{x} = 7.33) and to ensure that proper drainage systems are maintained (\bar{x} = 6.92). The respondents also expressed slight agreement regarding the importance of checking potential mosquito breeding sites around their neighbourhood (\bar{x} = 5.54); therefore, according to the respondents, it is essential to report illegal dumping sites, which could serve as possible mosquito breeding grounds, to the appropriate authorities (\bar{x} = 5.30).

On the other hand, the respondents moderately disagreed with the practice of killing mosquito larvae by adding larvicide to the water storage (\bar{x} = 3.45). In addition, the respondents slightly disagreed with the practice of

reporting abandoned and damaged vehicles that are idling in the neighbourhood ($\bar{x} = 4.49$), the presence of illegal gardens ($\bar{x} = 3.87$), and illegal building structures to the appropriate authorities ($\bar{x} = 3.97$).

Table 5. Details of the mean scores for practice questions

Question No.	Mean (\bar{x})	Interpretation
15	6.35	Moderately Agree
16	7.33	Agree
17	3.45	Moderately Disagree
18	6.92	Agree
19	5.30	Slightly Agree
20	4.49	Slightly Disagree
21	5.54	Slightly Agree
22	3.87	Slightly Disagree
23	3.97	Slightly Disagree
Total score	47.22*	Poor

Notes: * – total score interpretation as “Good” or “Poor” is based on an 80% cut-off point [15] (Total mark = 72; 80% cut-off point = 57.60)

Source: compiled by the authors

Table 6 presents the determination of strong predictors of good RPAP based on the multivariate regression analysis of the association between socio-demographic profiles and risk perception, attitude, and practice. It was found that sex ($p = 0.041$), educational attainment ($p = 0.041$), and employment status ($p = 0.034$) were factors associated with good risk perception. The findings revealed that females (OR = 1.493, 95% CI = 1.016-2.190) were statistically associated with higher odds of having good risk perception than males. In addition, college graduates (95% CI = 0.273-1.561) are 0.653 times more likely to exhibit a good risk perception of dengue fever than respondents with other educational attainments. Furthermore, unemployed individuals were statistically associated with lower odds of having a good risk perception of dengue fever than those employed (OR = 0.654, 95% CI = 0.441-0.970). With those factors in play, there is a need to reject the null hypothesis ($H_{01} = p < 0.05$); therefore, a significant relationship exists between being female, being a college graduate, being employed about having good risk perception.

Table 6. Multivariate logistic regression analysis between socio-demographic profile and risk perception, attitude, and practice, respectively

Characteristic	Risk perception*		Attitude*		Practice*	
	OR (95% CI) ^a	p-value	OR (95% CI) ^a	p-value	OR (95% CI) ^a	p-value
Age group		0.231		0.410		0.523
18-27 years	0.748 (0.357-1.567)		0.678 (0.216-2.126)		1.770 (0.791-3.963)	
28-37 years	0.800 (0.428-1.495)		0.546 (0.212-1.404)		1.591 (0.787-3.217)	
38-47 years	1.427 (0.802-2.536)		0.987 (0.385-2.532)		1.737 (0.915-3.299)	
48-57 years	1.025 (0.584-1.800)		0.549 (0.235-1.285)		1.468 (0.767-2.811)	
>57 years	0**		0**		0**	
Sex		0.041		0.297		0.583
Male	0**		0**		0**	
Female	1.493 (1.016-2.194)		1.331 (0.781-2.269)		1.123 (0.741-1.701)	
Civil status		0.056		0.038		0.431
Single	0.180 (0.018-1.822)		0.662 (0.255-1.714)		2.651 (0.257-26.268)	
Married	0.254 (0.026-2.520)		0.699 (0.318-1.714)		2.094 (0.216-20.264)	
Widow/Divorcee	0.141 (0.013-1.476)		0.250 (0.250-2.504)		1.451 (0.139-15.167)	
Others	0**		0**		0**	
Highest educational attainment		0.041		0.078		0.059
Elementary graduate	0.542 (0.205-1.430)		2.745 (0.724-10.401)		1.093 (0.340-3.517)	
High school graduate	0.546 (0.241-1.241)		1.231 (0.454-3.342)		1.619 (0.615-4.256)	
Senior high school graduate	0.171 (0.051-0.567)		0.701 (0.175-2.799)		0.746 (0.206-2.696)	
College graduate	0.653 (0.273-1.561)		1.948 (0.625-6.070)		2.405 (0.874-6.614)	
Graduate degree acquired	0.362 (0.093-1.410)		0.371 (0.072-1.924)		2.060 (0.469-9.055)	
Others	0**		0**		0**	
Employment status		0.034		0.111		0.566
Employed	0.654 (0.441-0.970)		0.638 (0.367-1.110)		0.884 (0.581-1.346)	
Unemployed	0**		0**		0**	
Monthly income (range in PHP)		0.155		0.234		0.579
<5,000	0.449 (0.208-0.968)		0.221 (0.046-1.070)		1.386 (0.617-3.110)	
5,000-9,999	0.588 (0.271-1.273)		0.274 (0.056-1.334)		1.193 (0.529-2.693)	
10,000-14,999	0.798 (0.358-1.780)		0.261 (0.053-1.283)		0.971 (0.412-2.289)	
15,000-24,999	0.743 (0.320-1.725)		0.421 (0.076-2.334)		1.653 (0.695-3.931)	

Continued Table 6

Characteristic	Risk perception*		Attitude*		Practice*	
	OR (95% CI) ^a	p-value	OR (95% CI) ^a	p-value	OR (95% CI) ^a	p-value
>25,000	0**		0**		0**	
Type of residential building		0.596		0.577		0.402
<i>Kubo or Payag</i>	0.358 (0.081-1.580)		0.377 (0.040-3.553)		0.517 (0.134-1.997)	
Single house/Bungalow	0.366 (0.088-1.520)		0.559 (0.063-4.939)		0.414 (0.116-1.481)	
Apartment	0.374 (0.082-1.698)		0.763 (0.076-7.630)		0.492 (0.124-1.951)	
Multi-unit building	0.528 (0.103-2.712)		0.063 (0.063-9.139)		0.772 (0.175-3.399)	
Condominium	0**		0**		0**	
Commercial building	0**		0**		0**	
History of dengue		0.457		0.709		0.194
Yes	0.809 (0.462-1.415)		0.863 (0.400-1.860)		0.666 (0.355-1.249)	
No	0**		0**		0**	

Notes: a – OR, Odds ratio (at 95% confidence interval); * – the reference category is: Poor; ** – this parameter is set to zero because it is redundant

Source: compiled by the authors

Moreover, it was noted that individuals who are 38-47 years old (95% CI = 0.802-2.536) are 1.427 times more likely to have a good risk perception of dengue fever compared to other age groups. In addition, married individuals (OR = 0.254, 95% CI = 0.026-2.520) were statistically associated with higher odds of having good risk perception than those with other civil statuses. Furthermore, individuals who have monthly incomes of less than PhP 5,000, live in *kubo* or *payag* and have no history of dengue were associated with lower odds of having good risk perception. It can be noted that individuals earning PhP 10,000-14,999 monthly (OR = 0.798, 95% CI = 0.358-1.780), living in multi-unit buildings like dormitories (OR = 0.508, 95% CI = 0.103-2.712), and having a history of dengue (OR = 0.809, 95% CI = 0.462-1.415) were more likely to have good risk perception of dengue fever.

However, it is worth noting that the null hypothesis (H_{01}) should not be rejected because the discussed sociodemographic profiles indicate $p \geq 0.05$; therefore, age ($p = 0.231$), civil status ($p = 0.056$), monthly income ($p = 0.155$), type of residential building ($p = 0.596$), and history of dengue ($p = 0.457$) were factors that do not have a significant relationship with good risk perception.

Furthermore, married (OR = 0.699, 95% CI = 0.318-1.714) individuals are statistically associated with higher odds of having a good attitude, and only civil status ($p = 0.038$) allows the null hypothesis ($H_{02} = p < 0.05$) to be rejected, which indicates that there is a significant relationship between being married and having a good attitude towards dengue prevention.

On the other hand, those who are 38-47 years old (95% CI = 0.385-2.532) are 0.987 times more likely to exhibit a good attitude than the other age groups. Aside from that, females (OR = 1.331, 95% CI = 0.781-2.269), elementary graduates (OR = 2.745, 95% CI = 0.724-10.401), employed individuals (OR = 0.638, 95% CI = 0.367-1.110), those earning PhP 15,000-24,999 (OR = 0.421, 95% CI = 0.076-2.334), individuals living in apartments (OR = 0.763, 95% CI = 0.076-7.630), and those with a

history of dengue (OR = 0.863, 95% CI = 0.400-1.860) were associated with higher odds of having a good attitude towards dengue prevention.

However, the rest of the socio-demographic profiles fail to reject the null hypothesis ($H_{02} = p \geq 0.05$); therefore, age ($p = 0.410$), sex ($p = 0.297$), educational attainment ($p = 0.078$), employment status ($p = 0.111$), monthly income ($p = 0.234$), type of residential building ($p = 0.577$), and having a history of dengue ($p = 0.709$) were factors that did not have a significant relationship with having a good attitude towards dengue prevention.

Lastly, it was found that individuals who are 38-47 years old (OR = 1.737, 95% CI = 0.915-3.299), females (OR = 1.123, 95% CI = 0.741-1.702), single individuals (OR = 2.651, 95% CI = 0.257-26.268), college graduates (OR = 2.405, 95% CI = 0.874-6.614), employed individuals (OR = 0.884, 95% CI = 0.581-1.346), those earning PhP 15,000-24,999 monthly (OR = 1.653, 95% CI = 0.695-3.931), individuals living in multi-unit buildings like dormitories (OR = 0.772, 95% CI = 0.175-3.399), and those with a history of dengue (OR = 0.666, 95% CI = 0.355-1.249) were associated with higher odds of having good practices for dengue prevention. However, the null hypothesis ($H_{03} = p \geq 0.05$); therefore, age ($p = 0.523$), sex ($p = 0.583$), civil status ($p = 0.431$), educational attainment ($p = 0.059$), employment status ($p = 0.566$), monthly income ($p = 0.579$), type of residential building ($p = 0.402$), and history of dengue ($p = 0.194$) were factors that did not have a significant relationship with having good practices for dengue prevention.

The findings show that risk perception and attitude ($r = 0.266, p < 0.001$), risk perception and practice ($r = 0.092, p < 0.027$), and attitude and practice ($r = 0.144, p < 0.001$) show a positive linear relationship despite the weak correlation, and all indicate the rejection of the null hypothesis ($H_{04}: x_1 \neq x_2 \neq x_3$). Therefore, there exists enough evidence that there is a significant relationship between the risk perception, attitude, and practice of Barangay Buhangin Proper residents regarding dengue infection (Table 7).

Table 7. Pairwise correlation matrix for RPAP

RPAP-area R	r	p-value	Relationship	Size of correlation
Risk perception vs. Attitude	0.266**	<0.001	Positive	Weak
Risk perception vs. Practice	0.092*	0.027	Positive	Weak
Attitude vs. Practice	0.144**	<0.001	Positive	Weak

Notes: r – pearson correlation coefficient, interpretation: -1.0 (perfect negative), -0.8>r>-1.0 (strong negative), -0.4>r>-0.8 (moderate negative), 0>r>-0.4 (weak negative), 0 (no linear relationship), 0<r<0.4 (weak positive), 0.4<r<0.8 (moderate positive), 0.8<r<1.0 (strong positive), 1.0 (perfect positive); ** – correlation is significant at the 0.01 level (2-tailed); * – correlation is significant at the 0.05 level (2-tailed)

Source: compiled by the authors

With this information considered, it is now important to develop more personalised interventions and to adapt practical approaches that could prove beneficial in addressing deep-rooted problems. To effect a behaviour change, health interventions may find it challenging to discourage ingrained negative habits through conventional knowledge sharing alone; however, the existence of the problem will only be resolved when all members of the community act in solidarity – with one goal: to eliminate dengue once and for all.

Utilising the Pragmatic 6SQuID Framework, community health interventions were developed by first defining and understanding the problem. It is known that Barangay Buhangin Proper has still recorded a significant increase in dengue cases despite the implementation of numerous interventions, as supported by the residents’ poor level of

practice. Generally, it affects all individuals in Barangay Buhangin Proper, and the problem exists at every socio-demographic level. The causes of the problem were identified, as shown in Figure 1, with complacency, self-serving behaviour, and interventions that are not targeted and personalised being the most significant. So far, the reproduction and dissemination of dengue information materials, regular clean-up drives, and the “5S *Laban sa Dengue*” programme have been effective in addressing the problem. However, the immediate consequence of poor practices leads to individuals acquiring dengue, and the long-term continuation of poor practices without appropriate intervention will inculcate a sense of normalcy regarding that habit within the members of the community, leading to rising dengue cases, affecting the general population’s health and diminishing the health security of the residents.

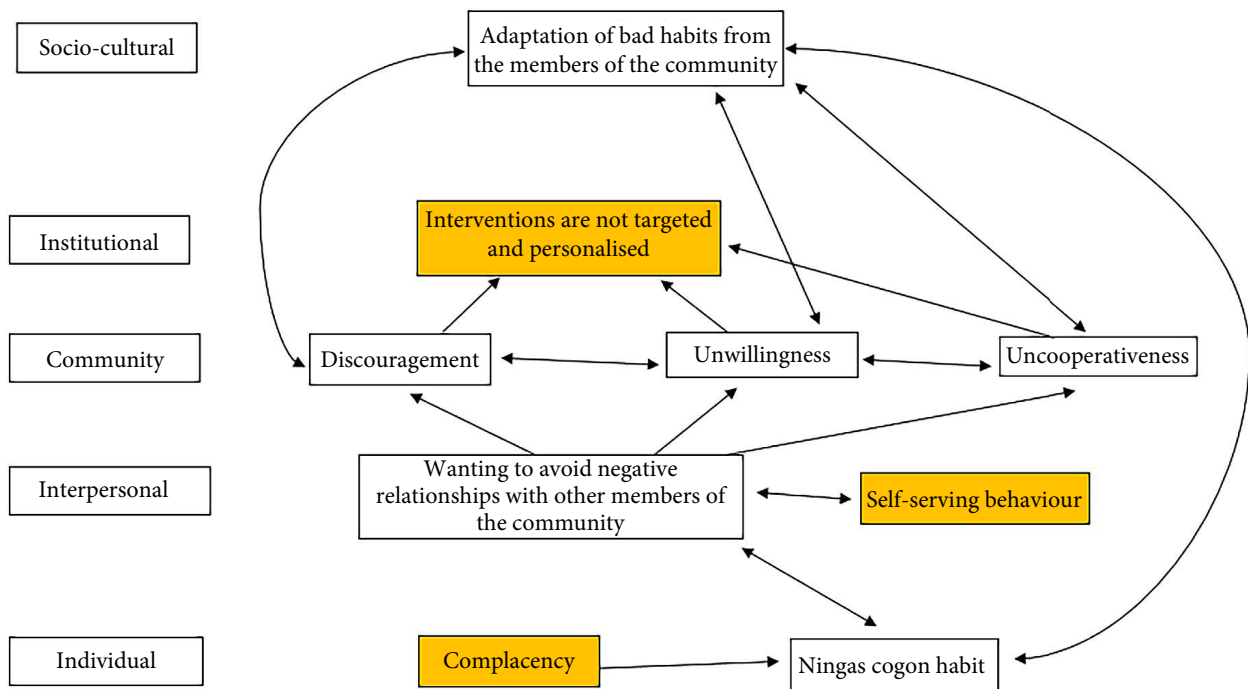


Figure 1. Causal pathways worsening the state of dengue in the community

Source: developed by the authors of this study

Accordingly, complacency is a factor that is malleable and has the greatest scope for change by reinforcing risk

perception and attitude towards dengue and building on practising long-term commitment to the interventions.

The change mechanism that could aid this is to develop interventions that would promote action against dengue even with or without the risk, and this is sufficient to reduce the problem if the factor is truly eliminated. Additionally, self-serving behaviour is another factor that could be mediated by promoting a sense of community and strengthening the shared responsibilities of each member of the community through the development of prevention programmes that promote collaboration. Lastly, the lack of targeted and personalised interventions is a factor with great potential for change and it can be sufficient in reducing the problem by utilising existing policies and interventions but requires a reconceptualization of the goals and objectives that target the significant determinants of poor RPAP.

With the significant determinants and malleable factors identified, it is important to deliver the change mechanisms by implementing the following developed community health interventions: (1) involving youth organisations in effective actions by spearheading long-term campaigns for the young population that commit to practising good prevention practices and reinforcing perceived risk and attitude towards dengue in the community; (2) engaging unemployed residents to fill pivotal roles in the dengue task forces in each purok so that risk perception, attitude, and practice regarding dengue infection are simultaneously addressed. At the same time, the population will have opportunities to earn money; (3) reinforcing knowledge on the risk and assessing the need for behavioural change for the male population by facilitating seminars regarding dengue, disseminating appropriate information, and exercising good dengue prevention practices; (4) continuing to facilitate weekly clean-up drives and inspections in residences to ensure appropriate practices are followed by all households to prevent potential breeding sites within their houses and surroundings; (5) taking advantage of social media by boosting the use of the Barangay Information Page as an avenue for the authorities to learn about the problems in the community and for the residents to share appropriate information on dengue, promoting community engagement by encouraging shared responsibilities and ensuring healthy discussions take place to address the problems related to dengue; (6) establishing dengue-specific support programme booths in the local barangay hall to alleviate the stigma associated with locals being reluctant to deal with and treat dengue, such as booths that re-evaluate the need for financial and blood banking assistance during admissions; and (7) utilising monitoring and assessment strategies by including routine operational evaluations to ascertain the state of the project and the actual inputs that the programme has received, along with epidemiological evaluations to determine the effectiveness or failure of the health interventions implemented in the community.

In summary, this study offers important insights into the factors associated with perceived dengue risk, attitude towards it, and practices among the residents in Barangay Buhangin Proper. The results are consistent with past research and provide novel insights into the association

between risk perception, attitude, and practices. The findings may provide direction for community health interventions that enhance understanding and propel individuals to actively participate in dengue prevention – the ultimate objective.

Discussion

Generally, the residents of Barangay Buhangin Proper exhibit good risk perception and attitude towards dengue infection, based on the 80% cutoff point; however, it was noted that they have poor practices for dengue prevention. The study's results on RPAP were comparable to a previous study by M.I.A. Zamzuri *et al.* [19], which found that the perceived risk of dengue infection exerts a positive effect on health behaviour change, although a lack of preventive practices is a problem identified in the study. However, it was found that RPAPs are significantly correlated with each other because risk perception was known to be a mediating variable between attitude and dengue prevention practice, and vice versa.

In the study, it can be observed that age can be a determinant of having good risk perception, as older individuals display better risk perception of dengue than those who are younger. This is supported by E.M. Bonem *et al.* [20], wherein older adults are less likely to engage in risky health behaviours than younger adults.

Moreover, the results of this study show that females are generally more cautious regarding dengue than males, and this has been recognised as a socio-demographic profile that has a significant association with good risk perception. This is reinforced by the study of A.N. Rakhmani *et al.* [21], which found that female respondents demonstrate better risk perception due to women's social role of caring for their households and families.

Furthermore, it was found that married individuals tend to have a heightened perceived risk and a better attitude towards dengue because, as elaborated by S. Selvarajoo *et al.* [22] and further supported by M. Hamed [23], married couples have a greater sense of obligation to protect their family members than those who are single, who are more dependent on their families. This results in a better attitude towards preventing dengue infection since families possess more resources for the comfort of their households and surroundings and the safety of their children.

In addition, the study reveals that college graduates notably have enhanced risk perception and a better attitude towards dengue. However, being a college graduate is only statistically associated with having good risk perception. Even though the majority of college graduates responded positively and were identified as having a good attitude, this is statistically not directly associated. This is supported by F.A. Diaz-Quijano *et al.* [24], who found that the higher an individual's education level, the more likely they are to recognise the risk of dengue and seek medical help in a timely manner. However, regardless of the level of education, people understand dengue as a disease and their attitude towards it is equally valid.

Aside from this, it can be noted that employed individuals have a stronger perceived risk than those who are unemployed. As determined by M. Nur Ain *et al.* [25], employed individuals possess better knowledge of dengue fever because of their exposure to workplace health campaigns, which increases their perception of dengue as a risk. Moreover, this socio-demographic profile has a direct association with good risk perception; therefore, being unemployed increases, the likelihood of an individual having poor risk perception. S. Selvarajoo *et al.* [22] state that the unemployed have a lesser outlook on risk, which results in higher-risk behaviours.

Additionally, the study reveals that there is a lack of evidence indicating that the socio-demographic profiles of the respondents are significantly associated with good practices. Therefore, the problem of practice exists among all respondents, regardless of their socio-demographic profile. Despite having good perceived risk and attitude towards dengue, it is noteworthy that although they are known to be correlated with each other, adequate knowledge of the risks and good behaviour towards dengue does not necessarily reflect good dengue prevention practices when complacency is at play, especially when the perceived risk diminishes [22].

M.I. Hossain *et al.* [26] have discovered that poor execution of preventive practices, despite having basic knowledge of dengue, leads to misunderstandings that increase in dengue cases. The majority of the causes of poor practices stem from bad habits and complacency in adhering to anti-dengue campaigns and measures [14, 27]. It was also highlighted that the residents' behaviour towards dengue is hindered by a lack of community cooperation and support, which remains an obstacle; only a few residents implement the necessary practices, and the majority tend to act only when cases are reported in their respective areas [28].

In the case of the residents of Barangay Buhangin Proper, it can be observed that significant dengue prevention practices are still performed within households. This could explain their acknowledgement of the importance of seeking immediate medical intervention when symptoms arise and ensuring that breeding sites for mosquitoes around their homes are eliminated, to name just a few. Moreover, the local government unit implements numerous interventions to combat the problem, such as regular clean-up drives. However, when the perceived risk diminishes, residents tend to become complacent and discontinue good prevention practices, leading to a rise in dengue cases. Furthermore, interpersonal and community factors may also be major contributors to the problem. It can be observed that residents address dengue issues independently and are reluctant to intervene in the affairs of their neighbours to avoid conflicts. This attitude may explain their reluctance to report the negative behaviours of other community

members, which are known to pose significant risk factors contributing to the escalating dengue cases in the community. The shared responsibility among community members is lost, rendering it ineffective for a household to maintain good prevention practices when those around them do not reciprocate this behaviour.

Conclusions

The goal was to assess the level of RPAP among residents in Barangay Buhangin Proper, Davao City, and to determine the relationship between RPAP and socio-demographic profiles. Overall, the study has provided a comprehensive analysis of the RPAP of residents in Barangay Buhangin Proper, Davao City, and has identified significant determinants of good or poor RPAP. It was found that the residents display good risk perception and attitude but have poor practices. Significant determinants such as age, sex, civil status, and educational attainment were revealed for risk perception, and educational attainment was noted for attitude; however, there were no significant determinants for practice. Furthermore, females, college graduates, and those who are employed have higher odds of exhibiting good risk perception, while married individuals are more likely to display a good attitude towards dengue. The results also indicate that there is a lack of evidence to suggest that the socio-demographic profile has a significant association with good practice, which means that the problem exists regardless of the profile.

The study also emphasises the need to develop prevention programmes that promote collaboration among community members, create interventions that encourage action against dengue, regardless of the perceived risk, and reinforce existing policies that target significant determinants contributing to poor RPAP. The problems, their causes, mechanisms for change, and methods of delivery have been identified. Therefore, the next step is to implement the developed community health interventions in the target community and evaluate their effectiveness. To effect change, the existence of the problem must be addressed by ensuring that community members act in solidarity – with a unified goal – to eliminate dengue once and for all.

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Conflict of Interest

None.

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Оцінка сприйняття ризику, ставлення та методів профілактики лихоманки денге у адміністративному регіоні Buhangin Proper міста Давао

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Анотація. Лихоманка денге продовжує бути проблемою громадського здоров'я на Філіппінах та у світі. Це дослідження мало на меті оцінити сприйняття ризику, ставлення та практику жителів Barangay Buhangin Proper та встановити, чи мають соціально-демографічні профілі значний вплив на сприйняття ризику, ставлення та практику запобігання, щоб розробити стратегічні заходи у сфері охорони здоров'я громади. Загалом 584 жителя відповіли на очне опитування з використанням адаптованого опитувальника сприйняття ризику, ставлення та практики. Згідно з балами сприйняття ризику, ставлення та практики, жителі мають добре сприйняття ризику (51,49, поріг = 51,20) та ставлення (43,62, поріг = 38,40), але мають погану практику (47,22, поріг = 57,60). Дослідження також виявило, що жінки (ВШ = 1,493, 95 % ДІ = 1,016-2,194, $p = 0,041$), випускники коледжу (ВШ = 0,653, 95 % ДІ = 0,273-1,561, $p = 0,041$) та працевлаштовані особи (ВШ = 0,654, 95 % ДІ = 0,441-0,970, $p = 0,034$) статистично пов'язані з добрим сприйняттям ризику, а одружені особи (ВШ = 0,699, 95 % ДІ = 0,318-1,714, $p = 0,038$) – з добрим ставленням, але жоден з факторів не був пов'язаний з доброю практикою. Тому проблема з практикою існує незалежно від профілю. Крім того, сприйняття ризику та ставлення ($r = 0,266$, $p < 0,001$), сприйняття ризику та практика ($r = 0,092$, $p = 0,027$), та ставлення та практика ($r = 0,144$, $p < 0,001$) показують слабкий позитивний лінійний зв'язок. Незважаючи на усвідомлення ризику та посилене ставлення, громада стикається з викликами у підтриманні добрих практик через самозаспокоєння, корисливу поведінку та неадекватні втручання. Дослідження пропонує впровадження розроблених заходів для вирішення корінних причин та ефективного усунення лихоманки денге

Ключові слова: соціально-демографічний профіль; розробка заходів у сфері охорони здоров'я громади; модифіковані фактори, що погіршують стан денге; механізми змін для запобігання денге; впровадження механізмів змін