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Factors Associated with the Quality of Life of People Living in Saltwater Intrusion Areas

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Abstract

Saltwater intrusion adversely affects both agriculture and mental health, yet its impact on quality of life (QoL) is underexplored. To understand the profound implications of saltwater intrusion on mental health and quality of life (QoL), especially when combined with other stress factors. The study aims to explore this underexplored relationship in saltwater intrusion-affected zones of Thailand. We investigated the QoL of 417 Thai agriculturists in saltwater-affected areas using the WHOQOL-BREF survey and multiple linear regression. Results indicated that a majority, 61.63%, experienced a moderate QoL, and a significant 83.69% reported tasting salinity in their water. A key finding was that individuals aware of their water's salinity had notably lower QoL scores. Influential factors on QoL included gender, age, household size, education, and occupation. Specifically, the detection of salinity in drinking water was linked to a 3.16-point reduction in QoL scores (Adjusted Mean Difference: -3.16, 95% CI: -5.08 to -1.25). Furthermore, those with an awareness of water salinity saw an additional QoL decrease of 4.40 points (Adjusted Mean Difference: -4.40, 95% CI: -6.84 to -1.96). The findings underscore the urgency for targeted government interventions to address the repercussions of saltwater intrusion. Strategies including the implementation of real-time alert systems and the establishment of protected freshwater reserves are vital for preserving agricultural productivity, ensuring water security, and enhancing the well-being of affected communities.

INTRODUCTION

Coastal regions worldwide are increasingly confronted with saltwater intrusion, a phenomenon primarily attributed to over-pumping, sea level rise, climate change, and underlying geological and hydrological conditions (U.S. Environmental Protection Agency, 2016; U.S. Geological Survey, 2019; USDA Climate Hubs, 2020). Such intrusion poses a formidable threat to freshwater reserves, resulting in the degradation of aquifers and estuaries, thus compromising potable water quality (U.S. Geological Survey, 2019; Hauer et al., 2020). This ecological perturbation not only upsets delicate balances but also hampers agricultural yields and industrial processes heavily reliant on freshwater resources (Alameddine et al., 2018; Safi et al., 2018; Shammi et al., 2019). A noteworthy agronomic implication of amplified salinity is its deleterious effect on crops (Lu et al., 2024; Su et al., 2025). When water salinity reach-

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es excessive levels, it can instigate reverse osmosis, where water is effectively drawn out from plant roots, thereby inducing plant dehydration, attenuating yields, or even resulting in complete plant demise (USDA Climate Hubs, 2020). Concurrently, the insidious onset of saltwater intrusion heightens the challenges associated with freshwater availability for agriculture and human consumption alike. Consequently, water insecurity becomes a tangible concern, often culminating in profound feelings of deprivation and uncertainty. Such environmental vicissitudes are invariably correlated with a decline in the overall quality of life of the affected populace (Palinkas & Wong, 2020). The intricacies of Quality of Life (QoL) encompass a diverse array of factors, from physical well-being and psychological disposition to social interactions and prevailing environment (Rahmah & Indrawati, 2024). In a bid to holistically assess these parameters, the World Health Organization proffered the WHOQOL-100 instrument. Given regional specificities, localized versions, such as the WHOQOL-BREF-THAI, were subsequently devised and validated (World Health Organization, 2020). Albeit numerous environmental studies have probed into determinants like air and noise pollution, there remains a conspicuous lacuna concerning the implications of water quality—especially in the milieu of saltwater intrusion. This observation is particularly salient in Thailand's context, given the nation's agricultural predilections (Goebel et al., 2019).

In this vein, the Nakhon Nayok Province, emblematic of Thailand's agrarian fabric, has borne witness to instances of saltwater intrusion. Paradoxically, empirical investigations delineating the ramifications of this phenomenon on resident QoL are scant. Addressing this research deficit, the present study endeavors to shed light on the interplay between saltwater intrusion and the well-being of denizens in the Nakhon Nayok Province. By harnessing the diagnostic prowess of the WHOQOL-BREF-THAI instrument, this research aims to proffer granular insights into the multifarious dimensions of agriculturists' QoL. The findings envisaged are poised to catalyze the conceptualization of bespoke interventions to bolster community welfare in the face of such ecological challenges.

METHOD

Study Location and Design

This research was executed in Nakhon Nayok Province, a local demonstrably impacted by saltwater intrusion. Employing a cross-sectional study paradigm, data acquisition transpired across two temporal epochs: March and July of 2022.

Study design and sampling

This study was a cross-sectional design with multi-stage random sampling and proportional allocation. The target population consisted of all residents living in Bang Luk Suea Sub district, Bang Sombun Sub district, Sai Mun Sub district and Ongkharak Sub district, Ongkharak District, Nakhon Nayok Province, Thailand, with a total population of 20,694 individuals. The sample size was calculated using a standard formula adjusted with the finite population correction factor. The minimum required sample size was 377 participants. To compensate for potential non-response and incomplete data, an additional 10% was added, resulting in a final target sample size of at least 417 participants. Sampling was conducted in two stages. In the first stage, villages within each sub-district were selected using simple random sampling. In the second stage, individuals within the selected villages were randomly chosen. The number of participants from each sub-district was determined based on the proportional-to-size method relative to the sub-district population. The final sample distribution was as follows: 72 participants (Bang Luk Suea), 80 participants (Bang Sombun), 115 participants (Sai Mun) and 150 participants (Ongkharak). Occupational categories were self-reported and subsequently classified into five subgroups to reflect the diversity of agricultural livelihoods in the study area: "Agriculturist" (general crop growers), "Farmer" (rice or field crop cultivators), "Fruit orchard" (fruit producers), "Inland fisheries" (freshwater fishers), and "Animal husbandry" (livestock keepers). This classification was intended to capture occupational variation relevant to household water use and potential exposure to salinity.

Instrumentation

Primarily, a sociodemographic questionnaire was employed to collect data on participants' gender, occupation, education, age, and household size. To assess quality of life (QoL), the study utilized the WHOQOL-BREF-THAI, a culturally adapted and psychometrically validated version of the original WHOQOL-BREF instrument developed by the World Health Organization. The Thai version underwent rigorous translation, back-translation, and field testing in accordance with WHO guidelines (Ministry of Public Health, 2002; WHO, 2020).

This 26-item instrument covers four domains—physical health, psychological health, social relationships, and environment—using a 5-point Likert scale ranging from 1 (indicating extreme dissatisfaction or very poor quality) to 5 (indicating high satisfaction or very good quality). The resulting domain scores were categorized into three levels: poor, moderate, and good. In this study, internal consistency reliability was assessed, yielding a Cronbach's alpha coefficient of 0.8406, which indicates good internal consistency. While no additional psychometric validation procedures such as factor analysis or test–retest reliability were conducted, we relied on the established validity and reliability of the WHOQOL-BREF-THAI instrument previously confirmed in multiple Thai populations.

QoL scores were categorized into three levels—poor, moderate, and good—based on the scoring guidelines used in the original validation of the WHOQOL-BREF-THAI instrument (Ministry of Public Health, 2002). The total score ranged from 26 to 130, with the following cutoffs: 26–60 (poor), 61–95 (moderate), and 96–130 (good). Each domain was also categorized according to domain-specific score ranges as specified in the original validation report.

Data Procurement Procedure

Personalized interviews, orchestrated face-to-face by trained research assistants, constituted the modus operandi for data collection. These interactions predominantly targeted agriculturists settled in locales grappling with saltwater intrusion. The stipulated inclusion criterion mandated respondents to be no younger than 18 years of age, who had resided in the study area for at least six months, and who were willing and able to provide informed consent. The exclusion criteria were individuals with serious physical or mental health conditions that impaired their ability to participate in the interviews, as well as those who declined to participate or withdrew consent during the interview process. Participants were selected based on these criteria to ensure that the data reflected the experiences and quality of life of those most affected by saltwater intrusion.

Statistical Analysis

The demographic constituents of the sampled population were delineated using descriptive analytics means and standard deviations (SD) for continuously scaled variables, and categorical variables were articulated via frequencies and percentages. To discern determinants intricately associated with quality of life, multiple linear regression techniques were deployed. Herein, each domain of the WHOQOL-BREF served as an outcome metric. Inferential significance was judged at a p-value threshold of less than 0.05. Analytic computations were facilitated by STATA software, version 15.1 (StataCorp, TX).

Ethical approval

This study was approved by the Srinakharinwirot University Ethics Committee for Human Research, Thailand (approval no. SWUEC-307/2564E)

RESULT AND DISCUSION

Of the 417 study participants, 201 (51.8%) were male, and 216 (48.2%) were female. The participants' mean age was 48.8 years with a standard deviation of 15.24. Household compositions varied, with a median size of 4 members, but ranged from singular residents to expansive households of 15 individuals. Predominantly, participants had achieved educational proficiency up to the junior high school level. Notably, 317 participants (76.02%) were engaged in agricultural activities. The demographic delineation of the cohort is elucidated in Table 1.

Daily Water Usage Patterns

The primary water source for diverse utilities (e.g., irrigation, personal hygiene, and laundry) was tap water, as reported by 83.45% of participants. Conversely, groundwater was the choice for 66 respondents (15.83%), while a negligible cohort (0.72%) harnessed water from natural aquifers such as rivers or canals. An intriguing revelation was that 83.69% of respondents detected a saline note in their water. For potable needs, a majority (55.44%) patronized bottled water. The manifestation of saline water was palpable predominantly during summer for 79.38% of respondents, yet 18.91% discerned it ubiquitously throughout the year. In the context of disseminated communication about saltwater intrusion from administrative quarters, a vast majority (83.93%) attested to an absence of such advisories. An intricate breakdown of water usage and perceptions is tabulated in Table 2.

Assessment of Quality of Life

Upon evaluation, there manifested discernible disparities in quality-of-life metrics across the quartet of domains. A predominant segment (61.87%) categorized their life quality as moderate, trailed by those who considered it good (35.25%). Only a fringe group (2.88%) judged their quality of life as suboptimal. Delving into the psychological facet, a majority (56.35%) opined a moderate life quality, while 43.41% re-

Table 1. Baseline characteristics of respondents

Characteristic	Total, n (%)	Bang Luk Suea, n (%)	Bang Sombun, n (%)	Sai Mun, n (%)	Ongkharak, n (%)
Number	417	72	80	115	150
Sex					
Male	201 (48.2)	42 (58.33)	41 (51.25)	51 (44.35)	67 (44.67)
Female	216 (51.8)	30 (41.67)	39 (48.75)	64 (55.65)	83 (55.33)
Age (years)					
Average mean ± SD	48.81 (18-87)	54.85 (22-81)	47.66 (18-87)	45.60 (18-83)	48.99 (21-86)
Household size					
Median	4	3	4	4	4
Min – Max	1-15	1-10	1-7	1-15	1-8
Education levels					
Primary	131 (31.41)	47 (65.28)	41 (51.25)	15 (13.04)	28 (18.67)
Junior high school	65 (15.59)	9 (12.5)	21 (26.25)	14 (12.17)	21 (14.00)
High school	127 (30.46)	11 (15.28)	8 (10)	48 (41.74)	60 (40)
Diploma	72 (17.27)	4 (5.56)	10 (12.5)	24 (20.87)	34 (22.67)
Bachelor's degree	22 (5.28)	1 (1.39)	0 (0)	14 (12.17)	7 (4.67)
Occupational status					
Agriculturist	317 (76.02)	61 (84.72)	67 (83.75)	66 (57.39)	123 (82)
Farmer	31 (7.43)	0 (0)	0 (0)	20 (17.39)	11 (7.33)
Fruit orchard	16 (3.84)	0 (0)	0 (0)	5 (4.35)	11 (7.33)
Inland fisheries	38 (9.11)	10 (13.89)	13 (16.25)	15 (13.04)	0 (0)
Animal husbandry	15 (3.6)	1 (1.39)	0 (0)	9 (7.83)	5 (3.33)

ported it as good. A minute 0.24% found it wanting. Similarly, in the realm of social interactions, 58.27% rated their quality of life as moderate, 35.73% as good, with 6.00% deeming it poor. In the environmental purview, dominant 70.98% reported a moderate life quality, with 28.30% and 0.72% reporting good and poor scores respectively. A granular representation of the quality-of-life indices across these domains is chronicled in Table 3.

Determinants Impacting Quality of Life in Saltwater Intrusion Vicinities

The analytical focal point of this investigation encompassed potential determinants influencing the quality of life for denizens of saltwater intrusion locales. Ensuing analyses illuminated multiple variables bearing significant nexus with quality-of-life metrics. Predominantly, the awareness of saltwater intrusion emerged pivotal. Variables such as gender, age bracket, respondent categorization, household composition, academic attainment, and vocational pursuits showcased noteworthy correlations. Specifically, those cognizant of saline contamination in potable sources manifested discernibly attenuated quality of life indices vis-à-vis their unaware counterparts (adjusted mean difference: -3.16; 95% Confidence Interval: -5.08 to -1.25). Furthermore, participants discerning salinity in their consumed water portrayed a notably diminished life quality metric, averaging a differential of -4.40 (95%CI: -6.84 to -1.96) juxtaposed against those oblivious to such salinity nuances.

The data derived from our study demonstrate a significant association between respondents' perception of salinity in various water sources—including drinking water, water used

Table 2. Patterns of water use in daily life

Characteristic	Total, n (%)	Bang Luk Suea, n (%)	Bang Sombun, n (%)	Sai Mun, n (%)	Ongkharak, n (%)
Number	417	72	80	115	150
Source of water for house cleaning, laundry or taking a bath					
Tap water	348 (83.45)	71 (98.61)	80 (100.00)	49 (42.61)	148 (98.67)
Ground water	66 (15.83)	0 (0.00)	0 (0.00)	64 (55.65)	2 (1.33)
River – canal	3 (0.72)	1 (1.39)	0 (0.00)	2 (1.74)	0 (0.00)
Are you feel salty from tap water, ground water or river – canal					
Yes	349 (83.69)	72 (100.00)	80 (100.00)	115 (100.00)	82 (54.67)
No	68 (16.31)	0 (0.00)	0 (0.00)	0 (0.00)	68 (45.33)
From previous question, what season you feel					
Summer	276 (79.08)	52 (72.22)	79 (98.75	72 (62.61)	73 (89.02)
Rainy	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Winter	7 (2.01)	7 (9.72)	0 (0.00)	0 (0.00)	0 (0.00)
All seasons	66 (18.91)	13 (18.06)	1 (1.25)	43 (37.39)	9 (10.98)
Source of water for drinking or cooking					
Bottled water	227 (54.44)	41 (56.94)	34 (42.50)	76 (66.09)	76 (50.67)
Filter taps water	131 (31.41)	8 (11.11)	42 (52.50)	22 (19.13)	59 (39.33)
Rain	55 (13.19)	23 (31.94)	4 (5.00)	13 (11.30)	15 (10.00)
Filter ground water	4 (0.96)	0 (0.00)	0 (0.00)	4 (3.48)	0 (0.00)
Are you feel salty from previous source					
Yes	188 (45.08)	44 (61.11)	75 (93.75)	26 (22.61)	43 (28.67)
No	229 (54.92)	28 (38.89)	5 (6.25)	89 (77.39)	107 (71.33)
Source of water for irrigation					
Tap water	6 (1.44)	1 (1.39)	0 (0.00)	0 (0.00)	5 (3.33)
Ground water	86 (20.62)	2 (2.78)	0 (0.00)	62 (53.91)	22 (14.67)
River-canal	325 (77.94)	69 (95.83)	80 (100.00)	53 (46.09)	123 (82.00)
Have you ever received saltwater intrusion information from government agency					
Yes	67 (16.07)	57 (79.17)	5 (6.25)	5 (4.35)	0 (0.00)
No	350 (83.93)	15 (20.83)	75 (93.75)	110 (95.65)	150 (100.00)

for cooking, agriculture, and animal husbandry—and lower quality of life (QoL) scores. Participants who reported awareness of saline water contamination tended to report lower QoL scores compared to those who did not report such awareness (Scheelbeek et al., 2017). These findings reflect correlations between perceived environmental stressors and subjective well-being, but should not be interpreted as evidence of causality, given the cross-sectional nature of the study

Table 3. Quality of life by using WHOQOL-BREF-THAI

Quality of life level	Total, n (%)	Bang Luk Suea District, n (%)	Bang Sombun District, n (%)	Sai Moon District, n (%)	Ongkharak District, n (%)
Number	417	72	80	115	150
1. Physical					
Poor	12 (2.88)	0 (0.00)	1 (1.25)	10 (8.70)	1 (0.67)
Moderate	258 (61.87)	66 (91.67)	78 (97.5)	55 (47.83)	59 (39.33)
Good	147 (35.25)	6 (8.33)	1 (1.25)	50 (43.48)	90 (60.00)
Pearson chi2(6) = 130.9156, p-value < 0.001					
Median (Min-Max)*	25 (14 - 34)	24 (19 - 32)	23 (15 - 27)	26 (14 - 33)	28 (16 - 34)
Median (IQR)	25 (22 - 28)	24 (21 - 25)	23 (22 - 24)	26 (22 - 29)	28 (23 - 30)
Average (SD)	25.1 (4.18)	23.38 (2.78)	23.26 (1.78)	25.23 (4.94)	26.79 (4.3)
*Kruskal-Wallis test, p-value <0.001					
2. Psychological					
Poor	1 (0.24)	0 (0.00)	0 (0.00)	1 (0.87)	0 (0.00)
Moderate	235 (56.35)	39 (54.17)	75 (93.75)	59 (51.3)	62 (41.33)
Good	181 (43.41)	33 (45.83)	5 (6.25)	55 (47.83)	88 (58.67)
Pearson chi2(6) = 63.1738, p-value < 0.001					
Median (Min-Max)*	22 (14 - 30)	22 (16 - 28)	20.5 (16 - 27)	22 (14 - 30)	23 (16 - 29)
Median (IQR)	22 (20 - 24)	22 (19 - 24)	20.5 (19 - 21.5)	22 (20 - 25)	23 (21 - 25)
Average (SD)	21.94 (2.97)	21.72 (3.12)	20.43 (1.81)	22.13 (3.44)	22.72 (2.71)
Kruskal-Wallis test, p-value <0.001					
3. Social relationships					
Poor	25 (6)	3 (4.17)	17 (21.25)	3 (2.61)	2 (1.33)
Moderate	243 (58.27)	56 (77.78)	61 (76.25)	51 (44.35)	75 (50)
Good	149 (35.73)	13 (18.06)	2 (2.5)	61 (53.04)	73 (48.67)
Pearson chi2(6) = 101.5081, p-value < 0.001					
Median (Min-Max)*	10 (5 - 15)	9 (5 - 15)	8 (5 - 12)	12 (7 - 15)	11 (7 - 15)
Median (IQR)	10 (9 - 13)	9 (9 - 11)	8 (8 - 9)	12 (10 - 13)	11 (10 - 13)
Average (SD)	10.65 (2.23)	9.65 (1.77)	8.4 (1.37)	11.68 (1.99)	11.53 (1.88)
Kruskal-Wallis test, p-value <0.001					
4. Environment					
Poor	3 (0.72)	1 (1.39)	0 (0.00)	2 (1.74)	0 (0.00)
Moderate	296 (70.98)	55 (76.39)	77 (96.25)	75 (65.22)	89 (59.33)
Good	118 (28.3)	16 (22.22)	3 (3.75)	38 (33.04)	61 (40.67)
Pearson chi2(6) = 41.6636, p-value < 0.001					
Median (Min-Max)*	27 (17 - 40)	27 (18 - 33)	23 (19 - 31)	27 (17 - 40)	29 (20 - 39)
Median (IQR)	27 (24 - 30)	27 (24 - 29)	23 (22 - 24)	27 (24 - 30)	29 (26 - 32)
Average (SD)	27.02 (4.07)	26.9 (3.16)	23.5 (2.31)	27.34 (4.25)	28.71 (3.91)
Kruskal-Wallis test, p-value <0.001					
Overall					
Poor	1 (0.24)	0 (0.00)	0 (0.00)	1 (0.87)	0 (0.00)
Moderate	257 (61.63)	55 (76.39)	77 (96.25)	61 (53.04)	64 (42.67)
Good	159 (38.13)	17 (23.61)	3 (3.75)	53 (46.09)	86 (57.33)
Pearson chi2(6) = 76.0533, p-value < 0.001					
Median (Min-Max)*	91 (60 - 124)	89 (67 - 110)	82 (70 - 103)	94 (60 - 124)	99 (68 - 118)
Median (IQR)	91 (82 - 101)	89 (80 - 95)	82 (79.5 - 85.5)	94 (83 - 103)	99 (87 - 106)
Average (SD)	91.42 (12.32)	88.33 (9.37)	82.68 (5.55)	92.99 (13.93)	96.37 (12.02)
Kruskal-Wallis test, p-value <0.001					

Table 4. Factors Associated with the Quality of Life of People Living in Saltwater Intrusion Areas: Bivariate Analysis

Characteristics	Number (n = 417)	Bivariate analysis	
		Mean difference (95%CI)	p-value
Sex			0.750
Male	201	Ref	
Female	216	-0.39 (-2.76, 1.99)	
Age (years)	417	-0.44 (-0.51, -0.38)	<0.001
Respondents' status			0.455
Member	278	Ref	
Head	139	-0.96 (-3.47, 1.56)	
Number of members	417	0.57 (0.03, 1.11)	0.040
Education level			<0.001
Bachelor's degree	22	Ref	
Primary	131	-18.80 (-23.31, -14.31)	
Junior high school	65	-14.31 (-19.12, -9.49)	
High school	127	-3.22 (-7.72, 1.29)	
Diploma	72	-3.46 (-8.21, 1.30)	
Occupational status			0.017
Agriculturist	317	Ref	
Farmer	31	2.46 (-2.06, 6.97)	
Fruit orchard	16	9.16 (3.02, 15.30)	
Inland fisheries	38	-1.79 (-5.9, 2.32)	
Animal husbandry	15	4.23 (-2.10, 10.56)	
Are you feel salty from tap water, ground water or river – canal			<0.001
No	229	Ref	
Yes	188	-8.08 (-10.34, -5.83	
Are you feel salty from drinking water			<0.001
No	68	Ref	
Yes	349	-6.74 (-9.88, -3.59)	

Note: Confidence intervals that include zero are not statistically significant at p < 0.05.

(Kimutai et al., 2023).

This observation aligns with previous research highlighting the multifaceted impacts of environmental stressors on agricultural communities (Miller et al., 2024). According to the World Health Organization (2022), climate change and its cascading effects—such as altered water quality—are known to affect not only physical livelihoods but also mental health. Salinity intrusion, often occurring during dry seasons or periods of low freshwater inflow, has become a chronic environmental stressor in lowland communities (Nguyen et al., 2024; Thanh et al., 2023).

Multiple social and occupational stressors compound the burden on rural populations. Prior research has shown that financial instability, exposure to agrochemicals, and limited healthcare access are associated with poorer psychological well-being among farmers (Rudolphi et al., 2020; Daghagh Yazd et al., 2020; Sinclair et al., 2024). Our findings, while limited in their ability to draw causal inferences, suggest that salinity perception may represent an additional layer of chronic environmental stress that correlates with diminished QoL scores.

Table 5. Factors Associated with the Quality of Life of People Living in Saltwater Intrusion Areas: Multivariate Analysis

Characteristics	Number (n = 417)	Multivariable analysis	
		Mean difference (95%CI)	p-value
Sex			0.430
Male	201	Ref	
Female	216	1.03 (-1.53, 3.60)	
Age (years)	417	-0.34 (-0.41, -0.26)	<0.001
Respondents' status			0.004
Member	278	Ref	
Head	139	4.32 (1.43, 7.21)	
Number of members	417	0.49 (0.08, 0.90)	0.018
Education level			<0.001
Bachelor's degree	22	Ref	
Primary	131	-9.56 (-14.29, -4.84)	
Junior high school	65	-9.38 (-14.06, -4.70)	
High school	127	-1.70 (-5.95, 2.55)	
Diploma	72	-3.34 (-7.78, 1.09)	
Occupational status			0.200
Agriculturist	317	Ref	
Farmer	31	0.03 (-3.39, 3.45)	
Fruit orchard	16	4.64 (-0.04, 9.31)	
Inland fisheries	38	-2.15 (-5.32, 1.02)	
Animal husbandry	15	-0.23 (-5.01, 4.55)	
Are you feel salty from tap water, ground water or river – canal			<0.001
No	229	Ref	
Yes	188	-3.16 (-5.08, -1.25)	
Are you feel salty from drinking water			<0.001
No	68	Ref	
Yes	349	-4.40 (-6.84, -1.96)	

Note: Confidence intervals that include zero are not statistically significant at $p < 0.05$.

Further, rising salinity levels have been linked to reduced agricultural productivity, ecological degradation, and concerns over the long-term sustainability of freshwater resources (Ierna & Mauromicale, 2018; Jalali et al., 2017; Kim et al., 2016; Riethmuller et al., 2023; Thach et al., 2023). Given this context, effective communication from local authorities about salinity risks and preventive measures remains crucial (Boyden et al., 2023). While this study relied on self-reported salinity perception rather than direct physicochemical testing, the findings underscore the relevance of lived experience in shaping health outcomes and perceptions of well-being.

Future research should integrate longitudinal designs, environmental measurements (e.g., conductivity, chloride levels), and mixed methods approaches to further investigate the temporal dynamics and underlying mechanisms of these associations.

Limitations of Study

This study has several limitations. First, its cross-sectional design precludes causal inference and leaves room for reverse or bidirectional associations, particularly between environmental awareness and QoL. Second, reliance on self-reported data may introduce recall bias, especially regarding perceptions of water salinity. Third, no objective water testing was conducted to confirm salinity levels, limiting environmental measurement precision.

While the WHOQOL-BREF-THAI showed good internal consistency (α = 0.84), we did not perform additional psychometric validation in this population. Moreover, the absence of qualitative data restricts contextual interpretation. Finally, with 76% of participants being agriculturists, findings may not fully generalize to other occupational groups. Future studies should address these limitations using longitudinal and mixed-method designs.

CONCLUSION

This study explored the associations between perceived salinity exposure and quality of life among residents in areas affected by saltwater intrusion. The results suggest that individuals who perceive salinity in their water sources are more likely to report lower QoL scores, particularly in the physical and psychological domains. These findings highlight the need for public health and environmental intervention in communities facing increasing risks of salinity intrusion.

However, due to the cross-sectional design, causal relationships cannot be established. The results represent associations that warrant further investigation through longitudinal and intervention-based studies. Future research should incorporate both subjective and objective measures of salinity exposure, as well as additional contextual factors—such as mental health, economic stressors, and access to public services—that may mediate or moderate the relationship between environmental change and quality of life.

It is recommended that local and national authorities prioritize real-time alert systems for salinity levels and ensure timely risk communication to affected populations. Supporting adaptation strategies, such as freshwater storage and access to water treatment technologies, will be key in mitigating the broader health and social impacts of saltwater intrusion in vulnerable regions.

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