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Assessment of Climate Change Anxiety in High School Youths of Kwale County, Kenya

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Climate change anxiety refers to negative cognitive, emotional, behavioural, and functional responses to experiences of climate change and has implications on mental health. The current study sought to determine how climate change anxiety relates to cognitive-emotional and functional impairments as well as with experience of climate change and behavioural engagement in youths. The study surveyed 388 youths (aged 13-24 years) in high schools in Kwale County, Kenya. Data were analysed in XLSTAT software using Pearson's correlation and considered significant for values of $p \leq 0.05$. Over 60 % of the youths had more than "Sometimes" suffered cognitive-emotional impairment, while 63 % were more than "Sometimes" inflicted with functional impairment. Additionally, 61 % of the respondents more than "Sometimes" reported having had a climate change experience. However, 71 % of the youths were more than "Sometimes" engaged in climate change behavioural activities. There were no significant gender differences in the scores. Cognitive-emotional impairment ($M = 2.507$, $SD = 1.267$) was significantly ($P = 0.0048$) associated with behavioural engagement in climate change ($M = 3.019$, $SD = 1.403$). Youths attending day schools scored significantly ($P = 0.022$) higher in functional impairment ($M = 2.897$, $SD = 1.182$) than students in boarding schools ($M = 2.535$, $SD = 1.395$). Youths aged 13-17 years were substantially more affected by climate change anxiety than those aged 18-24 years. This study identifies a population at risk with high exposure and vulnerability to the health impacts of climate change. The study suggests the need for policies to address climate change anxiety in youths in schools and the use of the youths' pro-environmental behavioural engagements in climate change to improve their adaptive capacity.

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INTRODUCTION

Anxiety disorders constitute a substantial worldwide health challenge and are associated with significant social, psychological, and economic costs (Beddington et al., 2008). Anxiety is maladaptive when it promotes ruminations about negative life events, leading to altered cognition characterised by difficulties in concentration; this, in turn, can lead to the build-up of negative emotions such as worry, depression, stress, and distress (Robinson et al. 2013). Use of validated psychometric scales has demonstrated that concerns about climate change are closely associated with difficulties in concentration and negative emotions among young people. Some scholars have termed this cognitive-emotional impairment (Clayton, 2020; Stewart, 2021; Albrecht, 2011). Additionally, anxiety disorders have been associated with significant disability and impairment in function. The 2013 Global Burden of Disease study, for example, documented mental illness, including anxiety disorders, as a major cause of years lived with disability (YLD), accounting for 21.1 % of all YLDs (Whiteford et al., 2013). Functional impairment, defined as the inability of a person to perform their usual daily occupational roles (McCallum et al., 2019), is reported to be higher in people with common mental disorders (Alonso et al., 2011). The simplest and most commonly used measure of functional impairment is self-reported "Days Out of Role", which seeks to establish the number of days a person cannot perform their daily roles due to poor physical or mental health (McCallum et al., 2019).

Climate change anxiety, broadly defined as negative cognitive, emotional, functional, and

behavioural responses to concerns about climate change, is beneficial in the short term because, like any other practical anxiety, it provokes humans to reassess and readjust their behaviours in an attempt to counter the causes of the anxiety (Pihkala, 2020). Climate change anxiety, for example, is associated with emotional feelings such as grief, worry, depression, and, in some situations, hope (Stewart, 2021; McQueen, 2021; Stanley et al., 2021). These emotional feelings are adaptive in the short term because they provoke a person to perceive and understand climate change events and respond appropriately, thus improving survival odds (El Zoghbi & El Ansari, 2004; Schwartz et al., 2022). However, prolonged exposure to climate change events, including media reports on climate change, has been reported to lead to chronic climate change anxiety with deleterious impacts on mental health (Ojala et al., 2021; Hogg et al., 2021). Documented evidence suggests that climate change anxiety can be maladaptive, leading to cognitive-emotional impairment as well as functional impairment (Feygina et al., 2010; Doherty & Clayton, 2011).

A recent study, for example, reported a close association between climate change anxiety-related cognitive-emotional impairment and functional impairment with symptoms of generalised anxiety disorder, while climate change anxiety-related functional impairment was closely associated with higher symptoms of major depressive disorder, including constant fatigue and lack of energy (Schwartz et al., 2022). Furthermore, recent studies have noted a close association between rising annual temperatures and an increase in suicidal behaviours (Cianconi et al., 2020; Heo et al., 2021). In 2020, Clayton

and Karazsia developed a tool for assessment of the impact of climate change anxiety on cognitive-emotional impairment and functional impairment as well as in relating climate change anxiety with an individual's experience of climate change and behavioural engagement with climate change (Clayton & Karazsia, 2020). The tool has validated items such as lack of concentration in studies and failure to have enough sleep for the assessment of climate change anxiety-related cognitive-emotional impairment. Further, the tool has identified failure to do or complete school assignments and poor relationships between students and their friends and families as items for ascertaining climate change anxiety-related functional impairment, while personal experience with climate change is associated with climate change anxiety triggered by thoughts of knowing a place that was useful to a person and was destroyed by climate change events such as displacements of families by floods. Additionally, the tool includes an assessment of behavioural engagements with climate triggered by climate change anxiety by determining the level of involvement in pro-environmental activities such as switching off lights and recycling waste (Clayton & Karazsia, 2020).

Although the National Climate Change Response Strategy was formed in 2010 to assess the impact of climate change on Kenya's development (MoALF, 2016), there is a dearth of information on the under-researched but significant mental health issues arising from climate change impacts, especially among the Kenyan youth. A need to mainstream climate change strategic response action plans at the county level was adopted by forming Kenya Adaption to Climate Change in Arid and Semi-Arid Lands. This was partly informed by the constitutional requirement for devolving resources and national government functions to county governments for addressing climate change action plans (MoALF, 2016), among several other climate change financing strategies. The climate change risk profile for Arid and Semi-Arid Counties has documented a plethora of adverse environmental weather events that include flooding leading to displacement of

persons and destruction of properties, increase in heat-stressed days, unreliable rainfall, and prolonged droughts. The report demonstrates how Kwale County, being an arid and semi-arid County and having 82.4 % of its residents rely on agriculture as a source of family subsistence and household income, is vulnerable and exposed to climate change-related hazards (MoALF, 2016). For example, the reported increase in annual temperature by 2°C has led to a reduced crop cycle, subsequently contributing to the current county's absolute poverty rate of 74.9 % (KDHS, 2022).

Existing literature indicates that climate change anxiety inflicts young people more and is associated with a significant rise in mental illness among adolescents and young adults (Hogg et al., 2021; Benoit et al., 2022). In Kenya, for example, A recent report indicates a rise in stress related cases among high school students manifested through students' protests, poor relationships among the students and with their teachers, destruction of school properties and even suicide cases among the students (Mutiso et al., 2023). Another study reported suicidal ideation rate of 22.6 % among Kenyan students in secondary schools and colleges (Ndeti et al., 2022). Globally, it has been estimated that 62.5 % of people aged 25 years diagnosed with mental ill-health experience symptoms (Solmi et al., 2022). Despite the substantial shift of weather-related events, there is a scarcity of information on how climate change anxiety relates to cognitive-emotional impairment and functional impairment of youths in high schools in Kenya. Further, there is a paucity of information on personal experience of climate change and behavioural engagement in climate change among the youths in high schools in Kenya. In Kwale county there are 446, 434 young people aged between 14 - 24 years, representing 5% of Kenya's youth of same age. A total of 49, 096 of the Kwale youth are students in high schools (MoE, 2023). Therefore, using Kwale county as a case study, this study applied the Clayton and Karazsia climate change anxiety assessment tool to determine:

- The extent of the impact of climate change anxiety on cognitive-emotional impairment and functional impairment in youths in high schools
- The current climate change anxiety impact landscape on personal experience of climate change and behavioural engagement in climate change among youths in high schools

MATERIALS AND METHODS

Study Area

Kwale County is one of the six counties in Kenya's Coastal region. It borders Taita Taveta County to the North West, Kilifi County to the North and North East, Mombasa County, and the Indian Ocean to the East and South East and the United Republic of Tanzania to the South West. The county is located in the Southern tip of Kenya, between Latitudes 30.05° to 40.75° South and Longitudes 38.52° to 39.51° East. Kwale County covers an area of about 8,270.2 Square kilometres, of which 62 is water surface. The county has a coastline that stretches 250 kilometres, and consists of corals, sands, and alluvial deposits. The Coastal Plain, the Foot Plateau, the Coastal Uplands, and the Nyika Plateau are the four principal topographical features of Kwale County. From the Foot Plateau, the Coastal Uplands, ascends steeply, reaching an altitude of 135–462 meters above sea level. This geographical area consists of numerous sandstone hills which include the Shimba Hills (420 m), Tsimba (350 m), Mrima (323 m) and Dzombo (462 m). On the western boundary, the Nyika Plateau gently climbs from roughly 180 meters and covers more than half of the county.

A basement rocks system lies beneath the plateau containing reddish sand soils patches. Since the soil in these regions is semi-arid and of low fertility, livestock rearing has become the predominant activity in the hinterland. The main rivers and streams found in Kwale County are Ramisi, Marere, Pemba, Mkurumuji, Umba, Mwachema and the Mwachi River. Three of these rivers are permanent (Marere, Mwaluganje, and

the Ramisi). The county has Monsoon climate: it is dry from January to April and coolest in June to August. Short rains are experienced from October to December while the long rains begin in March and end in June. However, a significant increase in heat has led to frequent drought in the county (County Government of Kwale, 2013)

Inclusion Criteria

The study sample included youths in high schools in Kwale county who consented to filling out study questionnaire. Youths who were enrolled in secondary schools in Kwale County but were residents of other counties were excluded from the study.

Study Methodology

The current study employed the Climate Anxiety Scale, a 22-item self-report questionnaire developed by Clayton and Karazsia in 2020 to assess climate change anxiety via a four-factor structure namely; 1) cognitive-emotional impairment, 2) functional impairment, 3) experience of climate change, and 4) behavioural engagement (Clayton & Karazsia, 2020). Three hundred and eighty-eight (388) youths randomly drawn from high schools in Kwale County who satisfied the inclusion criteria responded by filling out questionnaires during January and February 2023. The students responded to the questionnaire items by selecting either "Never", "Rarely", "Sometimes", and "Often" or "Almost Always" for each of the item. The responses were assigned 1 for "Never", 2 for "Rarely", 3 for "Sometimes", 4 for "Often" and 5 for "Almost Always" based on the Likert scale. The Clayton-Karazsia questionnaire comprises of 22 variables with variables 1-8, 9-13, 14-16 and 17-22 assessing climate change anxiety related cognitive-emotional impairment, functional impairment, personal experience of climate change and behavioural engagement respectively (*Table 1*). Pearson's correlation was used to analyse data, expressed as Mean (*M*) and Standard Deviations (*SD*), and data were considered significant for values of $P \leq 0.05$.

RESULTS

Demographic Characteristics of the Respondents

The sampled youths (aged between 13-24 years with a mean age of 17) comprised 259 males and 129 females representing 66 % and 34 % respectively of the respondents. Respondents were further grouped into young students (13-17 years) and old students (18-24 years). There were 258 young and 130 old students, representing 66.5 % and 33.5 % respectively, of the sampled respondents. 260 had a mean age of 18 years and 128 had mean age of 15 years, representing 67 % and 33 % of the sampled youths attended mixed-day schools and boarding schools, respectively.

Summary of the Responses for All Sampled Respondents

Table 1 Shows a correlation matrix for all variables in the analysis. Variables 1-8, 9-13, 14-16 and 17-22 respectively measured climate change anxiety-related impact on cognitive-emotional impairment, functional impairment, experience in climate change and behavioural engagement in climate change. All variables in each of the climate change anxiety sub scales; namely cognitive-emotional impairment, functional impairment, experience with climate change and behavioural engagement were positively and significantly ($P = 0.05$) correlated. Within the cognitive-emotional subscale, for example, respondents' failure to concentrate because of thinking about climate change was positively correlated with respondents' difficulties to sleep.

Respondents reported to suffer climate change anxiety-related functional impairment by, for example, being unable to have fun with family and friends because of climate change and this was positively and significantly correlated with interference to do school assignments and inability to work to full potential. Additionally, being directly affected by climate change was positively correlated with experience in climate change event that affected important place known by respondents while recycling wastes was

positively correlated with behavioural engagements that reduce climate change.

Table 1: Correlation matrix for all variables in the analysis N=388

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
• Thinking about climate change makes it difficult for me to sleep	0.477																				
• I have nightmares about climate change	0.247	0.361																			
• I cry because of climate change	0.355	0.317	0.467																		
• I think why I cannot handle climate change better	0.372	0.346	0.251	0.301																	
• I think about climate change	0.347	0.314	0.326	0.445	0.430																
• I write my thoughts about climate change	0.244	0.286	0.384	0.472	0.336	0.408															
• I react to climate change	0.277	0.262	0.264	0.309	0.364	0.348	0.322														
• I have no fun with family/friends when I think about climate change	0.363	0.316	0.352	0.439	0.295	0.403	0.437	0.378													
• I cannot balance my concerns about sustainability and family needs	0.269	0.412	0.384	0.291	0.365	0.410	0.309	0.379	0.401												
• Climate change interferes with my potential to do school assignments	0.427	0.370	0.207	0.337	0.230	0.303	0.301	0.294	0.436	0.290											
• Climate change undermines my work potential	0.355	0.388	0.264	0.382	0.368	0.337	0.305	0.328	0.416	0.386	0.493										

Table 2 shows a summary distribution of responses based on the number of less than "Rare", less than "Sometimes", less than "Often" and "Often to Almost Always" for each of the four factors measured revealed that more than 60 % of the respondents reported having "Sometimes" suffered some form of cognitive-emotional impairment such as having difficulties in concentration or sleeping wherever they thought of climate change. Over 63 % of the youths were "Sometimes" inflicted by functional impairment such as being unable to have fun with family or friends or being unable to do school assignments while more than 61% reported to have "Sometimes" had experience with climate change such as knowing a place important to them that was destroyed by climate change and or being directly affected by climate change. However, more than 71% of the respondents reported to

more than "Sometimes" engage in pro-environmental behavioural activities such as recycling and turning off lights, among others. Further, Table 2 shows the means and standard deviations for cognitive-emotional impairment and functional impairment as well as for experience of climate change and behavioural engagement with climate change as measured on the Likert scale. There was a significant association between cognitive-emotional impairment ($M=2.507$, $SD=1.267$) and the behavioural engagement in climate change activities ($M =3.019$, $SD =1.403$), $P = 0.0048$. A higher mean value was considered indicative of a high level of climate change anxiety related impairments, personal experience of climate change or intense behavioural engagement with climate change.

Table 2: Summary of the number of respondents for cognitive-emotional impairment, functional impairment, experience in climate change and behavioural engagement in climate change and the corresponding Means and Standard deviations

Type of Impairment	Less than "Rarely"	Less than "Sometimes"	Less than "Often"	"Often to almost always"	Mean	StD
Cognitive-Emotional	68	86	127	107	2.507	1.267
Functional impairment	96	46	117	129	2.665	1.377
Experience in climate change	95	53	108	132	2.748	1.417
Behavioural engagement	61	49	101	177	3.019	1.403

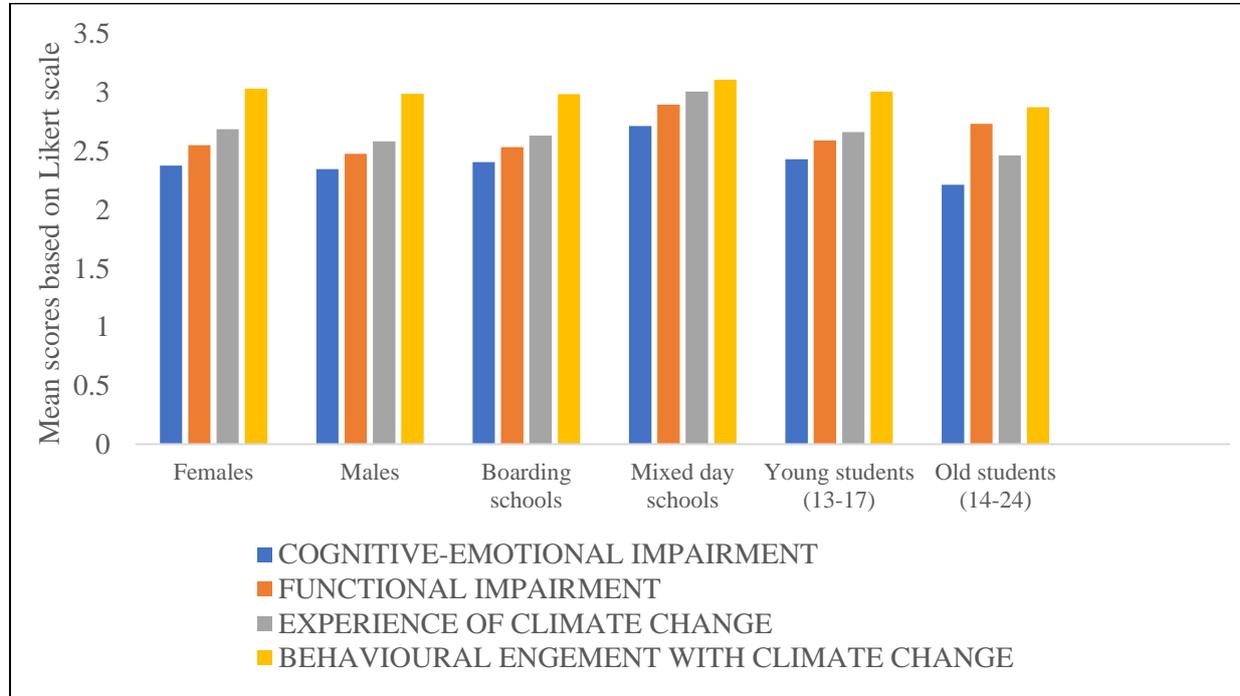
Climate Change Anxiety by Gender, Type of School, and Age of the Respondents

A comparison of the assessment of climate change anxiety on the youths' cognitive-emotional impairment and functional impairment and on their personal experience of climate change and behavioural engagement with climate change by gender indicates that females' scores were higher in all the four climate change anxiety factors measured. However, there were no significant gender differences in the scores. Scores of youths attending mixed-day schools were higher in comparison to the scores of youths attending boarding schools. However, the functional impairment score ($M = 2.897$, $SD = 1.182$) reported by the youths in the mixed-day schools was significantly higher than the equivalent score

of the youths in the boarding schools ($M = 2.535$, $SD = 1.395$), $P = 0.022$. The young respondents (aged 13-17 years, mean age of 16 years) scored significantly higher in all the measured four climate change anxiety-related factors compared to the old ones (aged 18-24 years, mean age of 19 years). The cognitive-emotional impairment score ($M = 2.432$, $SD = 1.274$) for the young youths was significantly higher compared to the score of the old youths ($M = 2.212$, $SD = 1.278$), $P = 0.00048$. Similarly, the functional impairment score ($M = 2.593$, $SD = 1.370$) for the young students was significantly higher than for the old students ($M = 2.374$, $SD = 1.408$), $P = 0.003$. The young students significantly scored higher in the personal experience of climate change ($M = 2.662$, $SD = 1.419$) than the old youths' score of

experience in climate change ($M = 2.463, SD = 1.469, P = 0.00045$). The behavioural engagement in climate change activities score ($M = 3.010, SD = 1.423$) for the young respondents was significantly higher than that of the old youths ($M = 2.875, SD = 1.467, P = 0.001$) (Figure 3).

Figure 3: Female respondents scored higher in all four factors of climate change anxiety than their male counterparts, but the scores were not significantly different



Youths attending mixed-day schools scored significantly ($P = 0.022$) higher scores in functional impairment than youths who were in boarding schools. Young students (13-17 years old) significantly scored higher in all the four measured factors of climate change anxiety than the old students (14-24 years old)

DISCUSSION

The objectives of the current study were twofold: to assess the extent of climate change anxiety on high school youths’ cognitive-emotional impairment and functional impairment and to determine the current landscape of climate change anxiety on youths’ experience in climate change and behavioural engagement with climate change. Data on the impact of climate change anxiety on the youths’ mental health is critical in informing policy decisions and in deploying strategic response action plans required in attenuating climate change anxiety in young people. Even though there were no significant gender differences in the scores, female students reported

higher mean scores in cognitive-emotional impairment and functional impairment as well as in the personal experience of climate change and behavioural engagement with climate change than the male students. This could be attributed to cultural and social factors documented in the County climate change risk profile for Kwale County, which noted that women’s experience of and exposure to adverse climate change events is more compared with males (MoALF, 2016). For example, about 31 % of households headed by females in Kwale County earn income from crop-related, on-farm activities while 37 % earn income from livestock activities (MoALF, 2016).

Cognitive-impairment was significantly associated with the sampled youths’ pro-environmental behavioural engagement in climate change activities. This probably implies that climate change anxiety-related cognitive-emotional impairment drives an inner desire among the youths in high schools to behave sustainably by, for example, recycling and turning off lights as a way of showing the intense need to

take care of the environment. A recent study reports that significant attenuation of climate change anxiety was achieved through collective pro-environmental behavioural engagement in climate change action plans rather than through individual pro-environmental behavioural engagement in climate change actions (Schwartz et al., 2022). Among the four climate change anxiety factors measured, this study identified the highest mean value score for behavioural engagement in climate change activities and, therefore, youths could be encouraged to engage in pro-environmental behavioural climate change activities collectively rather than as individuals.

Youths in mixed-day schools commute daily from their residences to their institutions of learning while those in boarding schools spend approximately three quarters of a year staying in their schools. In Kwale County an estimated 26,512 youths, representing 54 % of all students in high schools in the county, are enrolled in mixed-day secondary schools. Compared to the scores for the youths in boarding institutions, youths attending mixed-day schools reported higher mean scores in all four-climate change anxiety measured factors in this study. However, the score for functional impairment of youths in mixed-day schools was substantially high. While this study did not identify the underlying reasons for the higher scores among the sampled respondents in mixed-day schools, several factors could predispose youths in mixed-day schools to climate change anxiety. These factors may include food and water insecurity in the students' households and chronic exposure to heat-stressed days experienced by the learners as they commute to their schools. Additional factors include flooding that destroys road network, arable lands and crops interfering with the students' access to schools, adequate food, and sufficient household sanitation facilities. Additionally, inadequate household sanitation exposes the youth to water and food borne diseases. Furthermore, youths attending mixed-day schools may have direct experience of climate change related events such as loss of household livelihoods caused by prolonged drought-related loss of livestock.

Youths in mixed-day schools may also experience social impacts of climate change that may include domestic violence caused by limited resources, media reports that may include weather forecasts warning people of adverse events, images of dying animals, flooded rivers, destroyed homes and displaced families. This study concludes that boarding secondary schools provide some buffer against climate change anxiety-related impairments by shielding students against daily experience of household-based experiences of adverse climate change events.

In Kenya, the average age of youths joining high school is 12 years, and the completion age is 17 years (UNICEF, 2022). In this study, young respondents (aged 13-17 years) reported significantly higher scores in climate change anxiety-related cognitive-emotional impairment and functional impairment as well as in experience of climate change and behavioural engagement in climate change activities compared with the old respondents (aged 18-24 years). There is a need to determine whether the low scores in climate change anxiety among the old students in Kwale County reflects resistance to accepting climate change and whether such motivation to resist climate change correlates with the progressive aging of the students. In their study, Clayton and Karazsia observed a similar trend where the youngest in their sample, aged 18-35 scored higher than the oldest (Clayton & Karazsia, 2020). The Kwale County climate change risk profile lists limited access to information and extension services as a significant barrier to understanding of climate change and adaptive strategies among the residents (MoALF, 2016).

Additionally, research shows that resistance to accepting climate change may be motivated by the need to preserve the prevailing cultural, economic, and political structure of a community (Feygina et al., 2010) and, therefore, possibly as students age, they internalise their cultural, economic, and political structures demotivating them to have fewer concerns for climate change. In Kwale County, for example, households headed by youths provide most of the agriculture-

related labour estimated at 37 % of the hired labour (MoALF, 2016). A recent report by the UNICEF listed Kwale County among sixteen counties with the highest drop rate of youths from schools to provide labour in farms among other reasons. The report shows school truancy among the youth was highest during prolonged drought-related periods (UNICEF, 2021). Perhaps a community's motivation to resist climate change is an attribute passed on from one generation to the next. For example, despite major shifts in the county's weather patterns recorded over many years with subsequent deleterious impacts on the agriculture sector, more than 82 % of Kwale residents continue to be dependent on subsistence agriculture (MoALF, 2016).

CONCLUSIONS AND RECOMMENDATIONS

This study concludes that climate change anxiety significantly affects young students more than old students. The study, therefore, recommends that education authorities and other interested stakeholders should design and deploy psychosocial resources that address the distinct differences between these two groups of students. Additionally, there is need to evaluate use of different collective pro-environmental behavioural engagement in climate change activities programs for the young and the old youths. Such behavioural engagements in climate change activities should focus on sustaining the urge among young students to remain motivated to conserve environment and to guide and stimulate the old students to accept and adapt to climate change. Schools are ideal sites for addressing climate change anxiety in youths for several reasons. The institutions present logical and natural settings for implementation of interventions targeting climate change anxiety in students. Interventions in schools could assist in attracting students who would normally be unwilling or unable to seek professional assistance. Additionally, schools are appropriate in addressing climate anxiety effectively because students return repeatedly to their institutions and can better incorporate interventions in their daily routine (Fazel, 2014). This study recommends that

high schools administrators and managers consider improving access to information regarding climate change and adaptive strategies as a way of attenuating climate change anxiety-related distress in the youths.

Limitations of the Study

While this study provides critical data on the current landscape of the impact of climate change anxiety on youths in high schools in Kwale County, there are some limitations of the study. Kenya has forty-seven counties with people of diverse culture, social and economic backgrounds. Therefore, the current study findings may not be applicable in all the counties because different cultures and socio-economic exposures may have varied direct and indirect influences on the impact of climate change anxiety on people. Additionally, Counties have different climate change historical profiles. This study focused on climate change profile for Kwale County and, therefore, the study is limited in terms of applicability in other counties whose climate change profiles are different.

ABBREVIATIONS

KDHS	Kenya Demographic and Health Survey
MoALF	Ministry of Agriculture, Livestock and Fisheries
MoE	Ministry of Education
UNICEF	United Nations International Children's Emergency Fund
YLDs	Years Lived with Disabilities

Author Contributions

Patrick M. Mutua designed the study, collected, and analysed data and wrote the first manuscript draft. Matheaus K. Kauti, Musyoka Sonia Nzilani and Leonard Mwangangi reviewed and edited the final draft. All authors read and approved the final manuscript draft for submission

Statement on Data Availability

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request

Compliance with Ethical Standards

This study was approved by Kenyatta University Ethics Review Committee and assigned approval number PKU/2747/11871

Conflict of Interest

The authors declare that they have no conflict of interest

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