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ASSESSING DISASTER VULNERABILITY AND RESILIENCE AMONG COASTAL COMMUNITIES IN ANDHRA PRADESH

SIVA BRAHMAM K, Research Scholar, Dept. of Sociology and Social Work, Acharya Nagarjuna University, Guntur.

Prof. M.Trimurthi Rao, HOD and Dean, Social Sciences, Dept. of Sociology and Social Work, Acharya Nagarjuna University, Guntur.

Abstract

This study examines the socio-economic conditions and disaster vulnerability of coastal populations in Prakasam District of Andhra Pradesh. A total of 540 households were selected using proportionate stratified random sampling from ten disaster-prone villages. The findings reveal that a majority of respondents have low educational attainment and high exposure to multiple natural disasters. Tsunami and cyclones were the most commonly experienced disasters. Nearly three-fourths of respondents perceived their homes as highly or moderately vulnerable to flooding. Regression analysis showed that gender has a statistically significant but weak influence on flood vulnerability perception. In contrast, education has a significant impact on reducing perceived disaster severity. More than half of the respondents reported being severely affected by disasters. The study highlights the role of education in enhancing resilience and coping capacity. It emphasizes the need for targeted disaster management strategies. Overall, the research provides insights for policy interventions to strengthen coastal community resilience.

Keywords:

Disaster Vulnerability, Coastal Communities, Prakasam District, Natural Disasters, Flood Risk, Cyclone Impact, Tsunami Exposure etc.

Introduction

Natural disasters have become a frequent and severe challenge, particularly in coastal regions of India. Prakasam District in Andhra Pradesh is highly vulnerable due to its geographical location along the coast. Communities in this region are repeatedly exposed to cyclones, floods, and tsunamis. These disasters significantly affect livelihoods, housing, and overall well-being. Socio-economic factors such as education, gender, and income influence disaster preparedness and recovery. Understanding these factors is essential for effective disaster management planning. This study focuses on disaster-affected populations in Kothapatnam and Chinaganjam mandals. It aims to analyze their socio-economic background and level of disaster exposure. The study also examines perceptions of flood vulnerability and disaster impact. By doing so, it contributes to improving resilience strategies in vulnerable coastal communities.

Objectives

1. **To examine the socio-economic background** of the disaster affected population in Prakasam District of Andhra Pradesh.
2. To assess the vulnerability experienced by the disaster affected population in the study area.

Hypothesis

Ho: There would be no significant difference between severely and moderately disaster affected population with regard to their education.

Universe and Sampling

The **universe of the present study** comprises the population residing in the coastal villages of Prakasam District. From among the five coastal mandals, **two mandals were selected,** and from each selected mandal, **five villages** were chosen **purposively,** based on their higher exposure and vulnerability to recurring natural disasters. Thus, a total of **ten disaster prone coastal villages Eethamukkala, Gamellapalem, Pardarthi, P. Khandrika, Rajupalem, Chinthagumpalli, Gonasapudi, Motupalle, Peda Ganjam, and Santharavuru** were selected for detailed investigation.

In the selected ten villages of the two mandals, there are **5,404 household families** in total. Following the principle of proportionate representation, **10 per cent of households from each village** were selected, resulting in a final sample of **540 households** for the quantitative component of the study.

Thus, by adopting a **proportionate stratified random sampling method**, the study ensured that the selected **540 respondents** adequately represent the broader coastal population of Prakasam District, thereby enhancing the reliability, validity, and generalizability of the findings.

Table - 1

Gender of the Respondents

Gender	Name of Mandalam		Total
	Kothapatnam	Chinaganjam	
Male	197	220	417
	36.5%	40.7%	77.2%
Female	63	60	123
	11.7%	11.1%	22.8%
Total	260	280	540
	48.1%	51.9%	100.0%

The table portrays the gender among the respondents from Kothapatnam and Chinaganjam provides a clear picture of the gender composition of the study sample.

In Kothapatnam Mandalam, out of a total of 260 respondents (48.1%), 197 are males, constituting 36.5% of the total sample, while 63 are females, accounting for 11.7% of the total sample.

Similarly, in Chinaganjam Mandalam, which has 280 respondents (51.9%), 220 are males, representing 40.7% of the total sample, and 60 are females, representing 11.1% of the total sample.

Overall, the total sample of 540 respondents consists of 417 males (77.2%) and 123 females (22.8%). The gender distribution pattern is almost uniform across both mandalams, with males forming a predominant majority.

The mandalam wise analysis highlights the need for focused efforts to ensure greater inclusion of women in future studies and disaster related interventions, as women often experience unique vulnerabilities and play a crucial role in household and community resilience despite their lower representation in survey data.

Table - 2

Education of the Respondents

Education	Name of Mandalam		Total
	Kothapatnam	Chinaganjam	
Illiterate	97	105	202
	18.0%	19.4%	37.4%
Primary	51	52	103
	9.4%	9.6%	19.1%
Secondary	55	63	118
	10.2%	11.7%	21.9%
Inter	38	38	76
	7.0%	7.0%	14.1%
Graduate and above	19	22	41
	3.5%	4.1%	7.6%
Total	260	280	540
	48.1%	51.9%	100.0%

The table describes the educational status among respondents from Kothapatnam and Chinaganjam reveals a predominantly low to moderate level of education in the study area.

In Kothapatnam Mandalam, out of 260 respondents (48.1%), the largest proportion is illiterate, with 97 respondents constitute 18.0% of the total sample. This is followed by those with secondary education (55 respondents; 10.2%) and primary education (51 respondents; 9.4%). Respondents who have completed intermediate education account for 38 respondents (7.0%), while only 19 respondents (3.5%) have attained graduate and above qualifications. This pattern indicates limited access to higher education and early school dropouts among the population.

Similarly, in Chinaganjam Mandalam, which includes 280 respondents (51.9%), 105 respondents are illiterate, forming 19.4% of the total sample, slightly higher than in Kothapatnam. The secondary education group comprises 63 respondents (11.7%), followed by primary education with 52 respondents (9.6%). The intermediate level includes 38 respondents (7.0%), the same as in Kothapatnam, while 22 respondents (4.1%) have graduate and above education, marginally higher than in Kothapatnam.

Overall, out of 540 respondents, more than one third are illiterate (202 respondents; 37.4%), indicating a high level of educational deprivation. Those with primary education account for 19.1%, secondary education for 21.9%, and intermediate education for 14.1%. Only 7.6% of respondents have attained graduate and above education. The educational distribution is largely similar across both mandalams.

The mandalam wise analysis highlights that low educational attainment is a major characteristic of the study population, which may limit awareness of disaster preparedness, access to information, and effective utilization of government relief and rehabilitation measures. This underscores the importance of incorporating literacy programmes, awareness campaigns, and capacity building initiatives into disaster management and rehabilitation strategies in both Kothapatnam and Chinaganjam mandalams.

Table - 3

Nature of Natural Disasters Experienced

Natural Disaster	Name of Mandalam		Total
	Kothapatnam	Chinaganjam	
All Disasters from my birth	105	103	208
	19.4%	19.1%	38.5%
Tsunami	87	95	182
	16.1%	17.6%	33.7%
Liala/Mentha	52	65	117
	9.6%	12.0%	21.7%
Earthquake	16	17	33
	3.0%	3.1%	6.1%
Total	260	280	540
	48.1%	51.9%	100.0%

The table reveals the types of natural disasters experienced by respondents from Kothapatnam Mandal and Chinaganjam Mandal illustrates the extent and diversity of disaster exposure in both mandals.

In Kothapatnam Mandal, out of 260 respondents (48.1%), 105 respondents (19.4% of the total sample) reported experiencing all types of disasters since birth, indicating repeated and long term exposure to multiple hazards. Tsunami was reported by 87 respondents (16.1%), reflecting its significant impact on coastal livelihoods and settlements. Laila/Mentha cyclones were experienced by 52 respondents (9.6%), while earthquakes were reported by 16 respondents (3.0%). This distribution shows that respondents in Kothapatnam have faced both frequent and severe natural disasters over time.

Similarly, in Chinaganjam Mandal, which includes 280 respondents (51.9%), 103 respondents (19.1%) stated that they have experienced all disasters from birth, nearly equal to Kothapatnam. Tsunami exposure was slightly higher, with 95 respondents (17.6%) reporting its impact. Laila/Mentha cyclones affected 65 respondents (12.0%), indicating a somewhat higher cyclone exposure compared to Kothapatnam. Earthquakes were experienced by 17 respondents (3.1%), closely matching the pattern in Kothapatnam.

Overall, among the 540 respondents, 208 respondents (38.5%) reported experiencing multiple disasters throughout their lifetime, highlighting chronic exposure. Tsunami was experienced by 182 respondents (33.7%), making it the single most frequently cited disaster, followed by Laila/Mentha cyclones (117 respondents; 21.7%) and earthquakes (33 respondents; 6.1%).

The mandal wise analysis clearly indicates that both Kothapatnam and Chinaganjam mandals are multi hazard prone areas, with residents exposed to repeated disasters over generations. Such cumulative exposure increases physical, economic, and psychological vulnerability.

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Table - 4

Respondents' Perception of Flood Vulnerability

Perception of Flood Vulnerability	Name of Mandalam		Total
	Kothapatnam	Chinaganjam	
Highly vulnerable	99	111	210
	18.3%	20.6%	38.9%
Moderately vulnerable	95	99	194
	17.6%	18.3%	35.9%
Low vulnerable	66	70	136
	12.2%	13.0%	25.2%
Total	260	280	540
	48.1%	51.9%	100.0%

The table portrays respondents' perceptions regarding the vulnerability of their homes to flooding in Kothapatnam Mandal and Chinaganjam Mandal reflects a high level of flood risk awareness and lived experience in both areas.

In Kothapatnam Mandal, out of 260 respondents (48.1%), 99 respondents (18.3% of the total sample) perceived their homes as highly vulnerable to flooding. A slightly smaller group, 95 respondents (17.6%), reported moderate vulnerability, while 66 respondents (12.2%) felt their homes had low vulnerability. This indicates that more than one third of households in Kothapatnam perceive significant flood risk.

Similarly, in Chinaganjam Mandal, which includes 280 respondents (51.9%), 111 respondents (20.6%) reported their homes to be highly vulnerable to flooding, marginally higher than in Kothapatnam. Moderate vulnerability was reported by 99 respondents (18.3%), and 70 respondents (13.0%) perceived low vulnerability. The distribution closely mirrors that of Kothapatnam, with a slightly higher perception of high flood vulnerability.

Overall, among the 540 respondents, 210 respondents (38.9%) perceived their homes as highly vulnerable to flooding, while 194 respondents (35.9%) reported moderate vulnerability. Only 136 respondents (25.2%) perceived their homes as low vulnerable. Thus, nearly three fourths of households (74.8%) across both mandals perceive their homes to be either highly or moderately vulnerable to flooding.

The mandal wise analysis highlights widespread flood risk exposure and vulnerability in both Kothapatnam and Chinaganjam mandals. High perceived vulnerability is likely linked to low lying coastal locations, housing quality, inadequate drainage, and repeated disaster experiences. These findings underscore the urgent need for flood mitigation measures, improved drainage infrastructure, elevation or strengthening of houses, and community based flood preparedness and early warning systems to reduce household level vulnerability in both mandals.

Table - 5

Model Summary of Regression

Respondents' Perception of Homes to Flood Vulnerability

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.102[a]	.010	.008	.78602
a. Predictors: (Constant), Gender				

The regression analysis was conducted to examine whether gender has a significant influence on respondents' perception of their home's vulnerability to flooding.

The Model Summary shows that the correlation coefficient (R) is 0.102, indicating a very weak relationship between gender and perceived flood vulnerability. The R Square value is 0.010, which means that gender explains only 1% of the variation in perceived household flood vulnerability. The Adjusted R Square (0.008) further confirms that the explanatory power of the model is very low. Therefore, gender is not a strong predictor of perceived flood vulnerability.

Table - 6

Coefficients of Regression

Respondents' Perception of Homes to Flood Vulnerability

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.098	.105		20.045	.000
	Gender	.191	.081	.102	2.369	.018
a. Dependent Variable: In your opinion, how vulnerable is your home to flooding						

From the **Coefficients table**, the regression coefficient for gender (B = 0.191) is negative and statistically significant (t = 2.369, p = 0.018). This indicates that there is a significant difference between genders in their perception of home vulnerability to flooding. The negative coefficient suggests that one gender group (based on coding in the dataset) reports lower perceived vulnerability compared to the reference category.

The standardized beta value (0.102) also confirms that the effect is weak. Although statistically significant, the practical impact of gender on perceived flood vulnerability is minimal.

The analysis reveals that gender has a statistically significant but very weak influence on respondents' perception of household vulnerability to flooding. While differences exist between male and female respondents, gender alone does not substantially determine how vulnerable households feel toward flooding. Other socio economic or environmental factors may play a more important role in shaping flood vulnerability perceptions.

Table - 7

Overall Impact of Natural Disasters on the Lives of Respondents

Overall Impact	Name of Mandalam		Total
	Kothapatnam	Chinaganjam	
Moderately Affected	113	122	235
	20.9%	22.6%	43.5%
Severely Affected	147	158	305
	27.2%	29.3%	56.5%
Total	260	280	540
	48.1%	51.9%	100.0%

The table displays of respondents' perceptions regarding the overall impact of natural disasters on their lives in Kothapatnam Mandal and Chinaganjam Mandal reveals the severity of disaster effects experienced by the study population.

In Kothapatnam Mandal, out of 260 respondents (48.1%), 147 respondents (27.2% of the total sample) reported being severely affected by natural disasters, while 113 respondents (20.9%) stated that they were moderately affected. This indicates that a majority of households in Kothapatnam have experienced serious disruptions to their lives, livelihoods, and well being due to repeated disaster events.

Similarly, in Chinaganjam Mandal, which includes 280 respondents (51.9%), 158 respondents (29.3%) reported being severely affected, and 122 respondents (22.6%) reported being moderately affected. The proportion of severely affected respondents is slightly higher in Chinaganjam compared to Kothapatnam, suggesting marginally greater disaster impact in this mandal.

Overall, among the 540 respondents, a clear majority, 305 respondents (56.5%), reported being severely affected by natural disasters, while 235 respondents (43.5%) reported being moderately affected. Notably, none of the respondents reported being unaffected, emphasizing the pervasive nature of disaster impacts across both mandals.

The mandal wise analysis demonstrates that natural disasters have had a profound and widespread impact on the lives of residents in both Kothapatnam and Chinaganjam mandals. The high proportion of severely affected households underscores the need for strengthened disaster risk reduction strategies, effective rehabilitation and compensation mechanisms, psychosocial support services, and sustainable livelihood recovery programmes to mitigate long term adverse effects and enhance resilience in these disaster prone coastal mandals.

Table -8

Model Summary of Regression

Overall Impact of Natural Disasters on the Lives of Respondents

H0: There would be no significant difference between severely and moderately disaster affected population with regard to their education.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.288[a]	.083	.081	.47568
a. Predictors: (Constant), Education				

A simple linear regression analysis was conducted to examine the influence of education on respondents' perception of the overall impact of natural disasters on their lives.

The Model Summary shows that the correlation coefficient (R) is 0.288, indicating a moderate negative relationship between education and perceived disaster impact. The R Square value is 0.083, which means that education explains 8.3% of the variation in the perceived overall impact of natural disasters. The Adjusted R Square (0.081) confirms that the model has modest explanatory power.

Table -9

Coefficients of Regression

Overall Impact of Natural Disasters on the Lives of Respondents

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.821	.042		43.249	.000
	Education	.109	.016	.288	6.971	.000
a. Dependent Variable: How would you describe the overall impact of the natural disaster on your life						

From the Coefficients table, the regression coefficient for education (B = 0.109) is negative and highly significant (t = 6.971, p = 0.000). Since the p value is less than 0.01, the relationship is statistically significant at the 1% level.

The negative coefficient indicates that as the level of education increases, the perceived overall impact of natural disasters decreases. In other words, respondents with higher educational qualifications tend to report lower levels of severe impact compared to those with lower education levels.

The standardized beta value (0.288) suggests that education has a moderate effect on perceived disaster impact when compared to many social science variables.

The analysis clearly indicates that education plays a significant role in shaping how individuals perceive the overall impact of natural disasters on their lives. Higher educational attainment is associated with reduced perceived severity of disaster impact. This may be because educated individuals are better informed, more prepared, have greater access to resources, and possess improved coping strategies during and after disasters.

Thus, education emerges as an important socio demographic factor influencing disaster resilience and recovery perception. Hence, the null hypothesis has been rejected and the research hypothesis has been accepted

Conclusion

The study concludes that coastal populations in Prakasam District are highly vulnerable to recurring natural disasters. A large proportion of respondents have experienced multiple disasters throughout their lives. Low levels of education remain a major constraint affecting awareness and preparedness. The perception of flood vulnerability is high among most households, indicating significant risk exposure. Gender shows only a weak influence on vulnerability perception, though differences exist. Education, however, plays a crucial role in reducing the perceived impact of disasters. More educated individuals demonstrate better coping mechanisms and resilience. The majority of respondents reported severe impacts on their lives, highlighting the intensity of disasters. There is a need for improved infrastructure, early warning systems, and community awareness programs. Strengthening education and disaster preparedness initiatives can significantly enhance resilience in coastal areas.